Asthma in New Hampshire, 1990-2002

New Hampshire Department of Health and Human Services
Division of Public Health Services
Bureau of Chronic Disease Prevention - Asthma Control Program
29 Hazen Drive, Concord, New Hampshire 03301-6504
Phone: 603-271-0855 or 1-800-852-3345 ext. 0855
TDD Access: 1-800-735-2964
http://www.dhhs.nh.gov

Asthma in New Hampshire, 1990-2002

Craig R. Benson, Governor

John A. Stephen, Commissioner
Department of Health and Human Services

Mary Ann Cooney, Director
Division of Public Health Services

Prepared By:
Jody R. Wilson, MPH
New Hampshire Department of Health and Human Services
Division of Public Health Services
Bureau of Chronic Disease Prevention
Asthma Control Program
April 2004

For additional information on Asthma in New Hampshire, 1990-2002:
New Hampshire Department of Health and Human Services
Division of Public Health Services
Bureau of Chronic Disease Prevention - Asthma Control Program
29 Hazen Drive, Concord, New Hampshire 03301-6504

Phone: 603-271-0855 or 1-800-852-3345 ext. 0855
TDD Access: 1-800-735-2964
http://www.dhhs.nh.gov

ACKNOWLEDGEMENTS

Primary Author:
Jody R. Wilson, MPH, Assistant State Epidemiologist, Asthma Control Program, Bureau of Chronic Disease Prevention

Asthma Control Program Manager:
Lindsay Dearborn, MEd, MPH

Centers for Disease Control and Prevention:
Michele M. Mercier, MPH, Public Health Analyst
Jill Morris, PhD, Epidemiologist

Reviewer:
Andrew Pelletier, MD, MPH, Chronic Disease Epidemiologist

This work is supported by grant number U59/CCU120853-02 from the Centers for Disease Control and Prevention.

MESSAGE FROM THE GOVERNOR

During the past two decades, asthma has been a growing public health problem throughout the United States. With assistance from the federal Centers for Disease Control and Prevention, New Hampshire developed an asthma program in the Department of Health and Human Services in 2001. We now know that 9% of adults in the state currently have asthma. The estimated annual cost of the disease in New Hampshire is 46 million dollars. By effectively implementing established guidelines we can prevent much of the illness and death attributable to asthma. The data in this report will allow us to monitor asthma trends over time as we work to control asthma in New Hampshire. I look forward to subsequent reports that document our progress.

Craig R. Benson, Governor
State of New Hampshire

MESSAGE FROM THE COMMISSIONER

I would like to thank the Asthma Control Program of the Division of Public Health Services for their comprehensive report on asthma in New Hampshire. This is an instructive document that makes clear our current status on this disease here. This report also presents our targeted goals for reducing the incidence complications and hospitalization as a result of asthma.

The Department's primary goal is to improve the health of the citizens of New Hampshire. DHHS continually strives to do this through increasing the awareness of prevention and early intervention techniques so that the people of the state are not impacted by illnesses like asthma. To improve our ability to do this, the data from reports such as this is invaluable.

DHHS has also set ambitious goals in our *Healthy NH 2010* initiative to enhance the public health of our state. We will work to implement these strategies vigorously, so that each person in our state has an opportunity to lead a healthy life.

John A. Stephen, Commissioner
New Hampshire Department of Health and Human Services

TABLE OF CONTENTS

EXECUTIVE SUMMARY

- According to data from the 2002 Behavioral Risk Factor Surveillance System (BRFSS), approximately 14% of adults in New Hampshire had been told they had asthma at some time in their life.

- Approximately 8.7%, or 83,000, adults in New Hampshire reported current asthma in 2002. 10.9% of females had current asthma compared to 6.4% of males.

- Approximately 50% of New Hampshire adults with current asthma said they experienced asthma symptoms at least once a week.

- Twenty-eight percent of adults with asthma were current smokers and 59% were overweight or obese in 2002.

- There were 752 asthma-related hospitalizations of New Hampshire residents in 2001, a rate of 6.0 per 10,000 people. These hospitalizations resulted in 2,412 days spent in the hospital and total charges of approximately 4.2 million dollars.

- The median charge per asthma hospitalization was $4,356 and the average length of stay was 3.2 days in 2001.

- Children less than 5 years of age and adults 65 years and older had the highest rates of hospitalization for asthma in 2001.

- The hospitalization rate among females in 2001 was 7.4 per 10,000, compared to 4.5 per 10,000 among males. Female rates were higher than male rates from 1996 to 2001.

- The likelihood of hospitalization for asthma varied by both age and gender. Males aged 0 to 14 had higher hospitalization rates than females; after age 14, females had higher rates.

- The number of hospitalizations for asthma in New Hampshire varied by season of the year. In 2001, there were 109 asthma hospitalizations in April, compared to 29 in July.

- There were 6,096 asthma-related emergency department visits by New Hampshire residents in 2001, a rate of 49.3 per 10,000 people. These visits resulted in approximately 2.9 million dollars in total charges. The median charge per visit was approximately $400.

- The rate of asthma-related emergency department visits among New Hampshire females was 56.3 per 10,000 compared to 40.6 per 10,000 among New Hampshire males in 2001.

- Children less than 5 years of age and individuals aged 15 to 34 had the highest rates of asthma-related emergency department visits in 2001.

- There were 15 deaths of New Hampshire residents from asthma in 2001. Approximately two-thirds of all asthma deaths from 1990-2001 were among females.

INTRODUCTION

Asthma is a chronic respiratory disease characterized by reversible obstruction of the airways, airway inflammation, and airway hyper-responsiveness to a variety of stimuli. Nationally, asthma is the most common chronic disease of childhood and the fourth leading cause of disability in children.[1] The prevalence of self-reported asthma in the United States increased almost 74% in the past two decades, from 31.4 per 1,000 in 1980 to 54.6 per 1,000 in 1996 (when the National Health Interview Survey changed its questions on asthma).[2] According to data from the 2002 Behavioral Risk Factor Surveillance System (BRFSS), an estimated 16 million (7.5%) adults in the United States reported that they currently had asthma.[3]

Due to the large number of people affected, asthma results in considerable economic and social burden on the population. The burden of disease is not evenly distributed across geographic regions or population subgroups: women, children, African-Americans, and residents of urban areas are disproportionately affected by asthma. In 1998, asthma accounted for an estimated 12.7 billion dollars in expenditures in the US. The estimated total cost of asthma in New Hampshire in 1998 was 46 million dollars.[4]

Most of the morbidity and mortality from asthma can be prevented if the disease is managed according to established guidelines. Effective management includes control of exposure to factors that trigger exacerbations, adequate pharmacological management, ongoing monitoring of the disease, and patient education.[5]

In October 2001, the Centers for Disease Control and Prevention awarded a three-year planning grant to the New Hampshire Department of Health and Human Services to establish an Asthma Control Program. The program concentrates on asthma prevention and control from a public health perspective. The goals for this program are to:

- Build infrastructure within the state health department to address asthma
- Develop an asthma surveillance system to guide efforts and monitor progress
- Establish a statewide advisory council and convene a planning process to develop a comprehensive state asthma plan
- Begin implementing activities from the action plan

This document is the second annual compilation of data on asthma in New Hampshire. The report is organized into four major sections:

1) Asthma prevalence and control data for 2002 from the New Hampshire Behavioral Risk Factor Surveillance System (BRFSS)
2) Hospitalization data for 1996-2001 from the New Hampshire Inpatient Hospital Discharge data set
3) Emergency department visit data for 1996-2001 from the New Hampshire Outpatient Hospital Discharge data set
4) Mortality data for 1990-2001 from the New Hampshire Bureau of Vital Records

The data may be used to document the magnitude of the public health problem, assess trends over time, detect changes in health care practices, evaluate control strategies, and facilitate planning.

NEW INFORMATION IN THIS REPORT

- 2002 prevalence data from the Behavioral Risk Factor Surveillance System (BRFSS) are available.
- Data on asthma control and management from the BRFSS Adult Asthma History section are available for the first time.
- 2001 data on emergency department visits, inpatient hospitalizations, and deaths due to asthma are included.

FREQUENTLY ASKED QUESTIONS

Why are data not presented by race or ethnicity?

Based on the 2000 United States Census, New Hampshire's population is approximately 96.0% white, 1.3% Asian, 0.7% African American, 0.2% American Indian, and 0.6% persons reporting some other race. About 1.7% of the population is of Hispanic or Latino origin. Because no single racial or ethnic minority group exceeds 1.7% of the total population, the number of asthma-related events in these groups is too small to allow for meaningful analysis. As the state's demographics change and as data collection techniques improve, it may be possible to present data on racial and ethnic minorities in the future.

I would like to see data for town, but cannot find this information in the report. Why doesn't this report show town-level data?

New Hampshire has a relatively small population of 1.2 million people divided among 234 cities and towns. In a given year, the number of hospitalizations or deaths due to asthma is too small to generate meaningful results on a town level.

I am interested in looking at asthma mortality rates by year, but this report includes only 3-year rates. Why?

Only a small number of deaths from asthma occur in New Hampshire each year. Rates need to be calculated with at least 20 events in the numerator. Calculating a rate based on less than 20 events in the numerator creates an unstable estimate that is not statistically reliable and varies greatly from year to year by chance alone. For this reason, three years of data are aggregated to create more stable rates for asthma mortality.

Some of the information in the report is identified as "age-adjusted". What does this mean and why is it done?

To compare populations where the distribution of age groups is different, an adjustment needs to be made. For example, the rate of asthma in New Hampshire may appear higher than that of the United States. However, this may be due to New Hampshire having a greater proportion of older people than the United States. By age-adjusting the New Hampshire data using the 2000

United States standard population, rates can be compared without concern about differences in the age distribution of the two populations.

This report summarizes data from 1990-2002, but it is now 2004. Why is there such a long time between data acquisition and publication?

New Hampshire Vital Statistics and Hospital Discharge data are available approximately 18-24 months after the close of the calendar year. For example, data for 2001 became available mid-2003. BRFSS data is generally available 6-8 months after the close of the calendar year.

What does the 95% confidence interval mean?

A 95% confidence interval is reported around many statistics, especially those for asthma prevalence from the Behavioral Risk Factor Surveillance System. Since only a sample of New Hampshire residents are interviewed for the BRFSS, the exact frequency of asthma in the entire population is unknown. As a result, the population frequency is estimated using the information from the sample. The 95% confidence interval represents the range of values that, with 95% certainty, includes the true value for the entire population. For example, 13.9% of adults in New Hampshire reported they had ever been diagnosed with asthma. The 95% confidence interval was 12.8%-15.0%. This can be interpreted to mean that our best estimate is that 13.9% of persons have ever been diagnosed with asthma, but that the true value could actually be as low as 12.8% or as high as 15.0%. In other words, the estimate from the survey has a margin of error of ±1.1%.

How do I know if differences are statistically significant?

The confidence interval can be used to evaluate the statistical significance between two rates. If the interval for one rate does not overlap the interval for another, it is very likely that the difference between the groups is statistically significant. If the confidence intervals do overlap, the survey did not detect a statistically significant difference between the groups being compared. This could mean that no difference actually exists between the groups, or it could mean that a difference does exist but was not detected due to insufficient sample size.

What are the Centers for Disease Control and Prevention?

The Centers for Disease Control and Prevention (CDC) are part of the United States Department of Health and Human Services. The mission of the CDC is to promote health and quality of life by preventing and controlling disease, injury, and disability. The National Asthma Control Program, which is part of CDC's Air Pollution and Respiratory Health Branch, provides funds and guidance to many states for their asthma control efforts. In October 2001, New Hampshire received funding from the CDC to establish an asthma control program in the state.

Where can I get more information on asthma prevention, treatment, and research?

The National Asthma Control Program website is a good general resource for asthma and can be found at: http://www.cdc.gov/nceh/airpollution/asthma/default.htm. Detailed information on asthma and other lung diseases is available from the National Heart, Lung, and Blood Institute (NHLBI) at http://www.nhlbi.nih.gov/health/public/lung/index.htm, or the American Lung Association at http://www.lungusa.org. The New Hampshire chapter of the American Lung Association can be reached at 1-800-LUNG-USA or http://www.lungusa.org/newhampshire/. The New Hampshire Asthma Control Program can be reached at: 1-800-852-3345 ext. 0854 or http://www.dhhs.nh.gov/DHHS/ASTHMACONTROL/default.htm. The *AsthmaNow* New Hampshire website provides links to New Hampshire, New England, and national asthma resources. It can be accessed at http://www.asthmanow.net.

METHODS

The data sources used for asthma surveillance in New Hampshire are based on the recommendations of national organizations such as the Centers for Disease Control and Prevention (CDC) and the Council of State and Territorial Epidemiologists (CSTE). Measures for asthma mortality and inpatient hospitalization are from *Indicators For Chronic Disease Surveillance*[6], which was developed jointly by CSTE, the Association of State and Territorial Chronic Disease Program Directors, and the CDC. Measures for asthma emergency department visits and asthma prevalence are from CDC guidelines on the core elements of an asthma surveillance system. New Hampshire asthma surveillance data were analyzed using standard demographic breakdowns used by these organizations in order to facilitate comparisons with national data.

National Comparisons

In this report, New Hampshire rates are compared to rates for the US white population rather than to overall US rates due to the relatively small racial and ethnic populations in the state. Where appropriate, asthma-related objectives from *Healthy People 2010* or *Healthy New Hampshire 2010* are presented to put current asthma data from New Hampshire in perspective.

Age-Adjustment of Rates

In some tables, both crude rates and age-adjusted rates are presented. The crude rate is calculated by dividing the number of events by the state's population. Because the events of interest (e.g., hospitalizations and deaths) are more common as a person ages, the crude rate can be affected by the age-structure of a population. To control for the effect of age, rates were adjusted using the direct method and the 2000 United States standard population. The age-adjusted rate allows for more meaningful analysis when comparing data between states or when looking at trends in a single state over time.

Numerators for Rate Calculations

Numerators for rate calculations included New Hampshire residents only; residents of other states who were hospitalized or died in New Hampshire were excluded. New Hampshire hospital discharge data do not include out-of-state hospitalizations or emergency department visits of New Hampshire residents. New Hampshire vital statistics data include resident deaths that occur in other states.

Denominators for Rate Calculations

New Hampshire population estimates from the 2000 US Census were used as denominators for rate calculations. Intercensal population estimates were extrapolated by taking the difference between the 1990 and 2000 population estimates, dividing it by ten to obtain a yearly increment, and adding multiples of this amount to the 1990 population to obtain estimates for 1991-1999.

Survey Data

95% Confidence Intervals (95% CI) are presented when data are obtained from surveys, reflecting the degree of uncertainty for each estimate. Since surveys such as the BRFSS contact only a sample of the population, data from the sample are weighted according to census estimates so that the results are more representative of the entire population. BRFSS data in New Hampshire are weighted to reflect US Census parameters of gender and age, and to account for selection probability. Selection probability is a factor when adults live in households served by more than one phone number, or when they live in multi-adult households. The percentages and confidence intervals presented throughout this report reflect the results of the survey after the application of the weighting formula.

DATA SOURCES

Behavioral Risk Factor Surveillance System

The Behavioral Risk Factor Surveillance System (BRFSS) is a population-based, random-digit dialed telephone survey of civilian, non-institutionalized adults, aged 18 years and older. The survey is coordinated by the Centers for Disease Control and Prevention (CDC) and is conducted annually by all 50 US states, three territories, and the District of Columbia. New Hampshire has participated in the BRFSS since 1987. The BRFSS includes questions on health and behavior risk factors such as safety belt use, diet, weight control, asthma, alcohol use, physical exercise, and preventive health screenings.

A core set of questions, which has included adult asthma prevalence, is asked annually. Additional questions on asthma are asked in optional sections on adult asthma history and childhood asthma. The data are weighted to more accurately reflect the population by accounting for age, gender, and probability of selection. This report contains data on asthma from the 2002 New Hampshire BRFSS. Over 5,000 interviews were completed in the 2002 survey. New Hampshire and national data can be accessed on-line at: http://www.cdc.gov/brfss/. Additional information on the New Hampshire BRFSS is available from the Bureau of Health Statistics and Data Management at: http://www.dhhs.nh.gov/DHHS/BHSDM/default.htm.

Inpatient Hospital Discharge Data

Data on all New Hampshire hospitalizations are abstracted from medical records upon patient discharge and submitted electronically to the New Hampshire Hospital Association, which is under contract with the Department of Health and Human Services to collect the data. The inpatient data set contains discharge records on admissions for stays of 24 hours or more at all 23 acute-care, non-federal, inpatient facilities in the state. The Bureau of Health Statistics and Data Management oversees this data set. Hospitalization data are coded under the Ninth Revision of the International Classification of Diseases-Clinical Modification (ICD-9-CM). This report contains data on asthma inpatient hospitalizations from 1996-2001. Additional information about New Hampshire hospital discharge data is available on-line at:
http://www.dhhs.nh.gov/DHHS/BHSDM/Hospital-Discharge-Data.htm

Outpatient Hospital Discharge Data

The outpatient data set contains discharge records for hospital emergency department visits, observation stays in the emergency department after illness or injury, and hospital visits for scheduled ambulatory surgeries. The Bureau of Health Statistics and Data Management also oversees this data set. Outpatient data are coded under ICD-9-CM. This report contains data on asthma outpatient hospital visits from 1996-2001. Additional information about New Hampshire outpatient hospital discharge data is available on-line at:
http://www.dhhs.nh.gov/DHHS/BHSDM/Hospital-Discharge-Data.htm.

Vital Statistics

New Hampshire law requires that reports of all birth, death, fetal death, marriage, and divorce be filed with the office of the State Registrar in the Bureau of Vital Records. The Bureau of Vital Records was located in the Department of Health and Human Services until September 2003 when it was moved to the Secretary of State's office. The Bureau of Health Statistics and Data Management in the Department of Health and Human Services maintains and analyzes these data. Depending on the event, filings are made by hospital personnel, physicians, funeral directors, city/town clerks, attorneys, and clerks of the courts. Reports of New Hampshire resident births and deaths in other states, and Canada, are provided to the State Registrar, for statistical purposes only, under an inter-state/Canadian agreement for the exchange of vital events information. The 1998 New Hampshire Vital Statistics Report may be accessed on-line at: http://www.dhhs.nh.gov/dhhs/bhsdm/library/default.htm

The cause of death reported on a death certificate is the underlying cause of death. In a death record, the underlying cause of death is the specific disease, condition, or injury that initiated the chain of events leading to death. The underlying cause of death is not always the same as the immediate cause of death. For example, if a person was hospitalized for asthma, but developed pneumonia and died while in the hospital, the underlying cause of death would be asthma.

Deaths are coded based on the applicable revision of the International Classification of Diseases (ICD). From 1979-1998, deaths were coded under ICD Revision 9. In 1999, deaths began to be coded under ICD Revision 10. The National Center for Health Statistics reports a comparability ratio of 0.8938 for the coding of asthma mortality under ICD-10 as compared to ICD-9. This means that approximately 11 percent fewer deaths will be classified with asthma as the underlying cause under ICD-10 than under ICD-9. This report contains data on asthma mortality from 1990-2001. Additional information on deaths in New Hampshire is available at: http://www.dhhs.nh.gov/DHHS/BHSDM/Death+Data.htm

Healthy People 2010

Healthy People 2010 is a set of national health targets for the next decade. It builds on initiatives pursued over the past two decades including the 1979 Surgeon General's Report, *Healthy People*, and *Healthy People 2000: National Health Promotion and Disease Prevention Objectives.* It is designed to achieve two overarching goals: 1) increase quality and years of healthy life, and 2) eliminate health disparities. Eight Healthy People 2010 objectives address asthma (see Appendix B). A copy of Healthy People 2010 can be obtained on-line at: http://www.health.gov/healthypeople/.

Healthy New Hampshire 2010

Healthy New Hampshire 2010 is New Hampshire's health promotion and disease prevention agenda for the first decade of the 21st century. Similar to Healthy People 2010, it is a compilation of health objectives for the next decade. Healthy New Hampshire 2010 has one asthma-related objective: to reduce pediatric hospitalizations for asthma (see Appendix B). A copy of Healthy New Hampshire 2010 can be obtained on-line at: http://www.healthynh2010.org/.

I. ASTHMA PREVALENCE AND CONTROL

Prevalence data is an important component of asthma surveillance because it provides information on how many people have asthma and helps characterize the population with asthma in terms of age, sex, and other demographic factors. This type of information can provide an indication of the burden of asthma on the population and identify groups that may be disproportionately affected by the disease. Prevalence data can also be used to examine trends in the occurrence of asthma over time. These data may underestimate the burden of asthma in the population, however, because they capture only those individuals who have been diagnosed with asthma by a doctor or other health professional. Due to the fact that asthma is a chronic and variable disease that often has a slow onset, it may remain undiagnosed for years in some individuals.

The Behavioral Risk Factor Surveillance System (BRFSS) is a population-based telephone survey of adults aged 18 and older that is coordinated by the Centers for Disease Control and Prevention. It is designed to monitor the prevalence of the major behavioral health risks associated with premature morbidity and mortality. New Hampshire has participated in the BRFSS since 1987. In 2000, two asthma questions were added to the BRFSS core survey in an effort to systematically collect data on adult asthma prevalence in all participating states and territories. Results from these two questions provide information on lifetime asthma prevalence and current asthma prevalence among adults.

This section presents data from the 2002 New Hampshire BRFSS. It includes information on lifetime and current asthma prevalence among adults in the state, asthma control and management among adults with current asthma, and the percentage of adults who reported having a child with asthma. Data were analyzed by age, sex, education, and income groups whenever possible to determine whether asthma prevalence varied by these demographic factors. In addition, factors such as general health status, smoking status, weight, and influenza vaccination were compared among adults with and without current asthma.

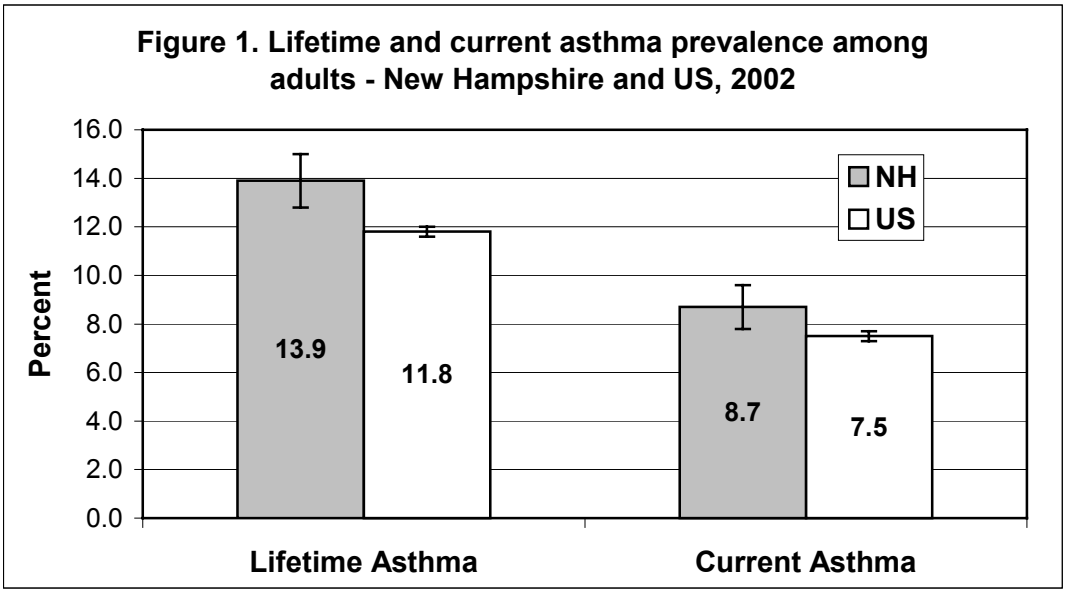
Lifetime asthma refers to the number of people who answered yes to the question “Have you ever been told by a doctor that you had asthma?” The lifetime asthma prevalence rate is calculated by dividing the number of people who report lifetime asthma by the number of people who complete the survey. Current asthma refers to the number of people who answered yes to two questions: “Have you ever been told by a doctor that you had asthma?” and “Do you still have asthma?” The current asthma prevalence rate is calculated by dividing the number of people who report current asthma by the number of people who complete the survey. Denominators used in all prevalence calculations excluded “Don’t Know/Not Sure” and “Refused” responses.

A list of asthma questions used in the 2002 New Hampshire BRFSS survey can be found in Appendix A.

ASTHMA IN ADULTS

Table 1. Lifetime and current asthma prevalence among adults—New Hampshire and United States, 2002

	Lifetime Asthma Percent (95% CI)	Current Asthma Percent (95% CI)
New Hampshire	13.9 (12.8, 15.0)	8.7 (7.8, 9.6)
United States	11.8 (11.6, 12.0)	7.5 (7.3, 7.7)

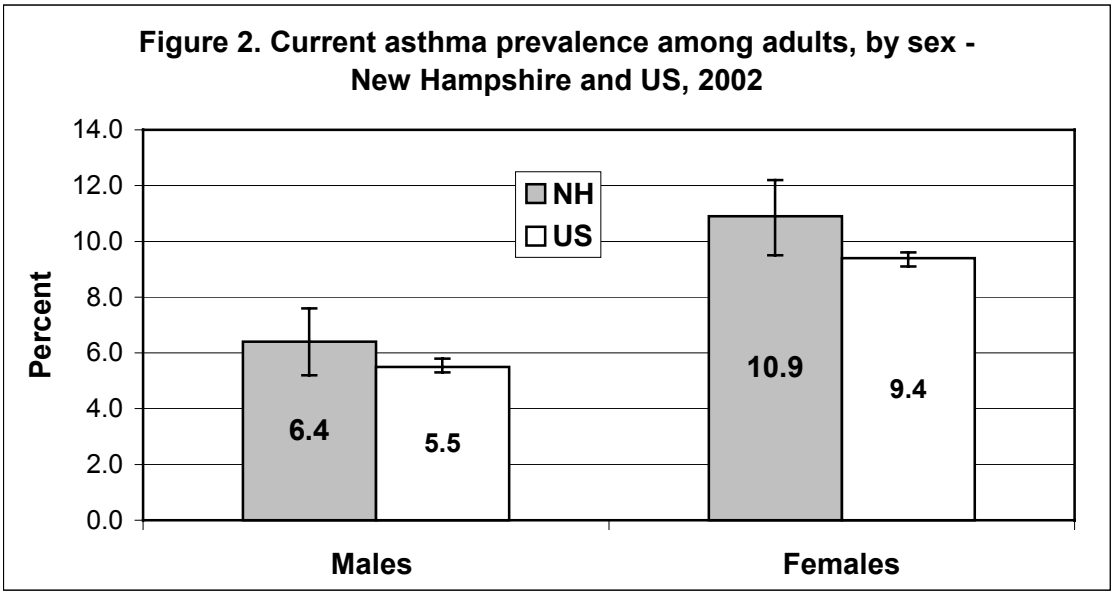


Comment: Overall, 13.9% of New Hampshire adults have been told they had asthma at some time in their life. Approximately 8.7% of adults said they had current asthma in 2002. 2002 lifetime and current asthma prevalence estimates were higher than 2001 estimates, although the increase was not statistically significant.

Lifetime asthma prevalence for the United States as a whole was 11.8% and current asthma prevalence was 7.5% in 2002. Both lifetime and current asthma prevalence were significantly higher in New Hampshire than in the United States in 2002.

Table 2. Prevalence of current asthma among adults, by sex—New Hampshire and United States, 2002

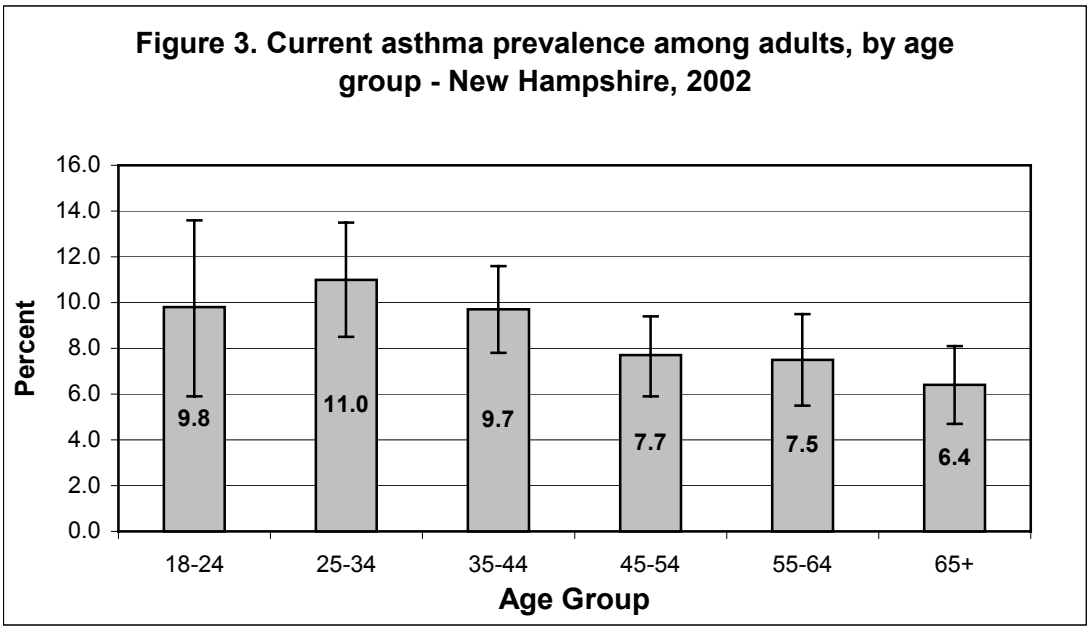
	New Hampshire		United States	
Sex	**Percent**	**95% CI**	**Percent**	**95% CI**
Males	6.4	(5.2, 7.6)	5.5	(5.3, 5.8)
Females	10.9	(9.5, 12.2)	9.4	(9.1, 9.6)
Total	8.7	(7.8, 9.6)	7.5	(7.3, 7.7)



Comment: Approximately 6.4% of adult males and 10.9% of adult females in New Hampshire said they had current asthma in 2002, compared to 5.5% of males and 9.4% of females in the U.S. as a whole. Females were significantly more likely to have current asthma than males, both in New Hampshire and nationally.

Table 3. Prevalence of current asthma among adults, by age group--New Hampshire and United States, 2002

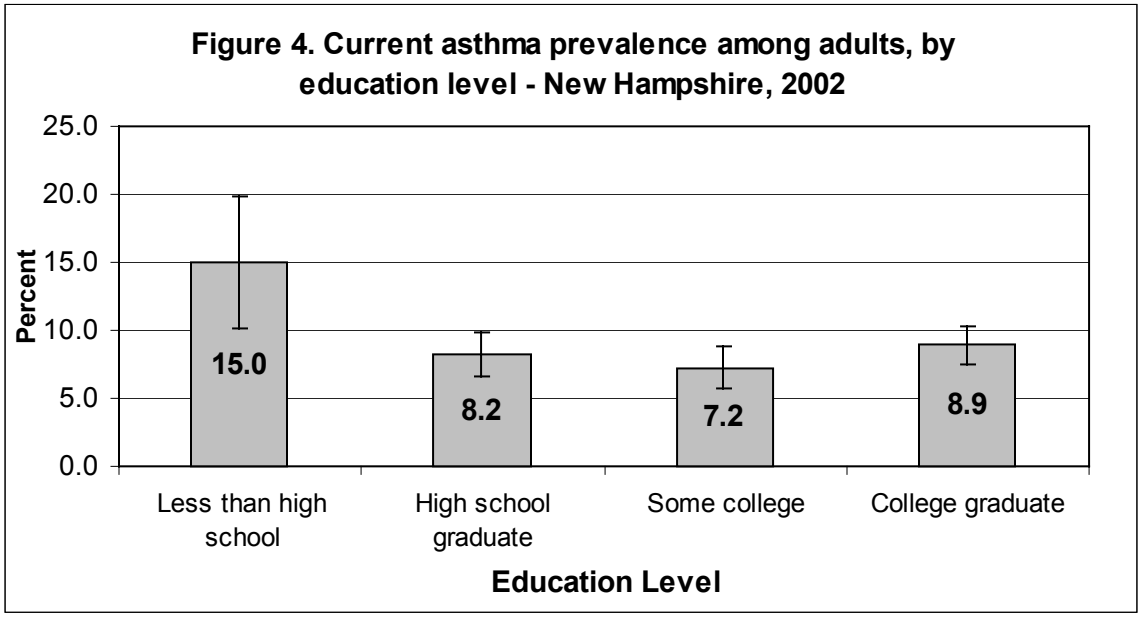
	New Hampshire		United States	
Age Group	**Percent**	**95% CI**	**Percent**	**95% CI**
18 to 24	9.8	(5.9, 13.6)	8.3	(7.7, 8.9)
25 to 34	11.0	(8.5, 13.5)	7.4	(6.9, 7.8)
35 to 44	9.7	(7.8, 11.6)	7.1	(6.7, 7.5)
45 to 54	7.7	(5.9, 9.4)	7.7	(7.3, 8.1)
55 to 64	7.5	(5.5, 9.5)	7.8	(7.3, 8.3)
65 and older	6.4	(4.7, 8.1)	7.1	(6.7, 7.6)
Total	8.7	(7.8, 9.6)	7.5	(7.3, 7.7)



Comment: New Hampshire adults aged 25 to 34 were significantly more likely to report current asthma than adults 65 and older. New Hampshire adults aged 25-34 and 35-44 were more likely to report current asthma than U.S. adults in the same age groups. No other significant differences in current asthma prevalence between age groups were seen in 2002.

Table 4. Prevalence of current asthma among adults, by education level--New Hampshire and United States, 2002

	New Hampshire		United States	
Education Level	**Percent**	**95% CI**	**Percent**	**95% CI**
Less than high school	15.0	(10.1, 19.9)	9.0	(8.4, 9.6)
High school graduate/GED	8.2	(6.6, 9.8)	7.4	(7.1, 7.8)
Some college	7.2	(5.7, 8.8)	7.8	(7.4, 8.2)
College graduate	8.9	(7.5, 10.3)	6.7	(6.4, 7.0)
Total	8.7	(7.8, 9.6)	7.5	(7.3, 7.7)

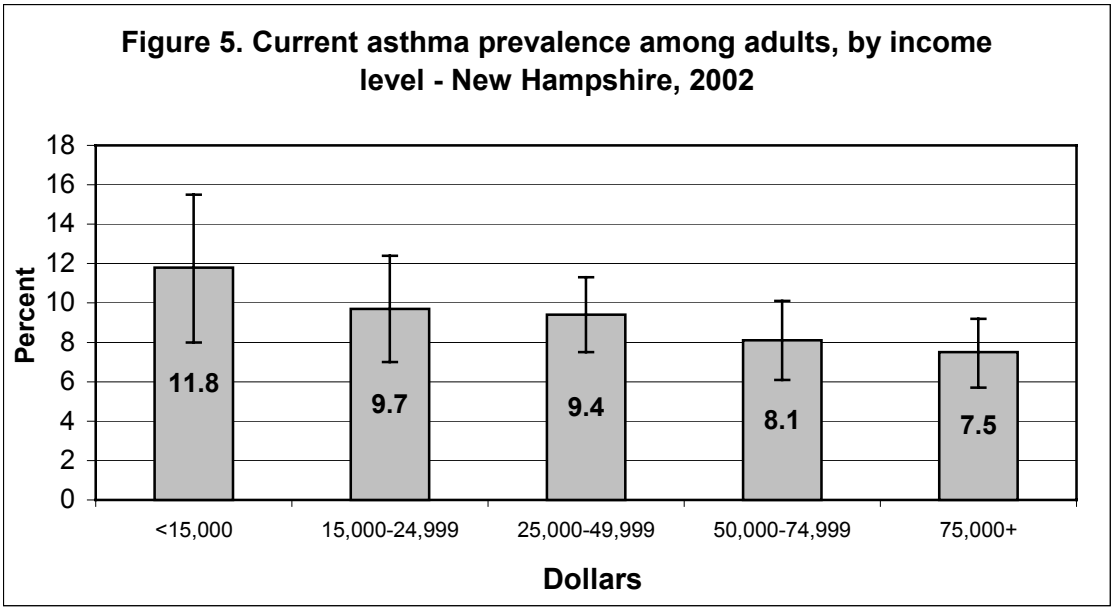


Comment: In 2002**,** New Hampshire adults with less than a high school level of education were more likely to report current asthma than high school graduates or adults with some amount of college education. New Hampshire adults with less than a high school degree and college graduates were more likely to report current asthma than U.S. adults with similar levels of education. No other differences between education groups were statistically significant.

Table 5. Prevalence of current asthma among adults, by income level--New Hampshire and United States, 2002

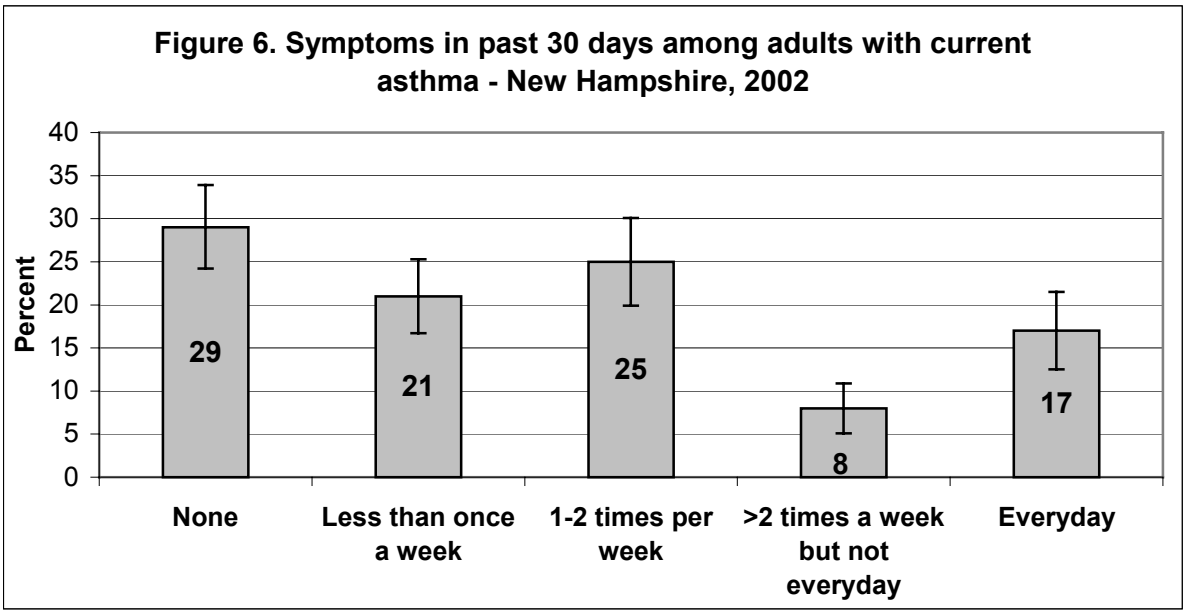
	New Hampshire		United States	
Income Level	**Percent**	**95% CI**	**Percent**	**95% CI**
Less than $15,000	11.8	(8.0, 15.5)	10.5	(9.8, 11.2)
$15,000-$24,999	9.7	(7.0, 12.4)	8.4	(7.9, 8.8)
$25,000-$49,999	9.4	(7.5, 11.3)	7.3	(6.9, 7.6)
$50,000-$74,999	8.1	(6.1, 10.1)	6.5	(6.1, 6.9)
$75,000 and higher	7.5	(5.7, 9.2)	6.3	(5.9, 6.7)
Total	8.7	(7.8, 9.6)	7.5	(7.3, 7.7)

Figure 5. Current asthma prevalence among adults, by income level - New Hampshire, 2002



Comment: There were no statistically significant differences in current asthma prevalence by income level in 2002. Income refers to self-reported total annual household income.

ASTHMA CONTROL AND MANAGEMENT AMONG ADULTS WITH CURRENT ASTHMA

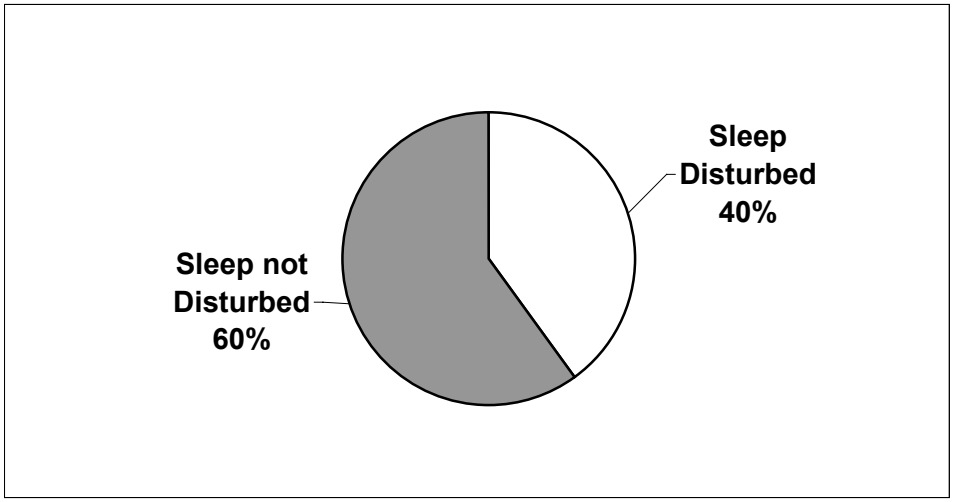


Comment: When asthma is managed according to established guidelines, people with asthma should experience minimal or no chronic symptoms. In 2002, 71.1% (95% CI: 66.3, 75.9) of New Hampshire adults with current asthma said they experienced asthma symtoms in the past 30 days. In comparison, combined BRFSS data from nineteen states* (including New Hampshire) that used the adult asthma questions on their survey in 2002 indicate that approximately 75.1% (95% CI: 73.1, 77.2) of adults with asthma had symptoms in the past 30 days.[3]

About half of New Hampshire adults with asthma said they had asthma symptoms at least once a week.

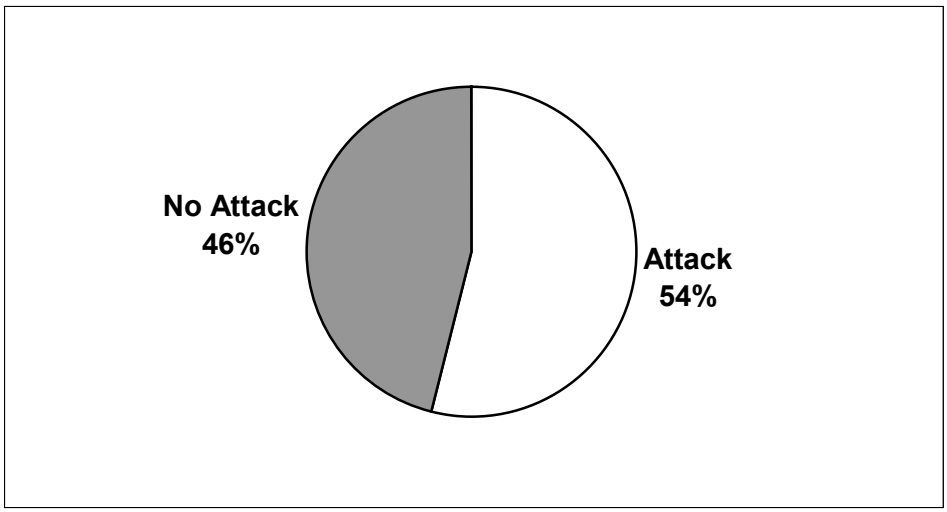
*California, Delaware, District of Columbia, Idaho, Iowa, Louisiana, Massachussetts, Michigan, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, Rhode Island, Texas, Utah, Wisconsin, and the U.S. Virgin Islands.

Figure 7. Difficulty sleeping in past 30 days due to asthma symptoms - New Hampshire, 2002



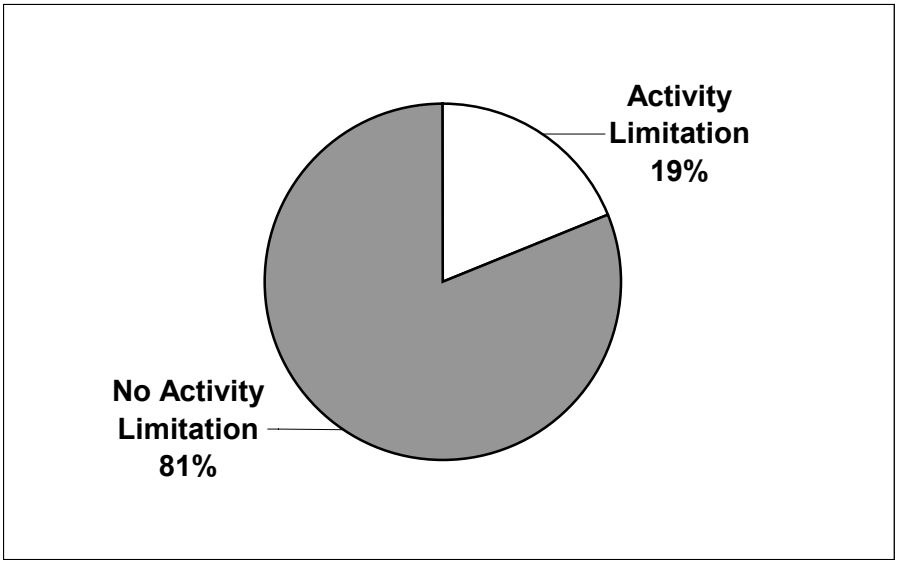
Comment: With optimal asthma control and management, there should also be minimal or no chronic nighttime asthma symptoms. Approximately 40.4% (95% CI: 33.9,46.9) of New Hampshire adults with current asthma said their sleep was disrupted due to asthma symptoms sometime in the past 30 days. According to combined BRFSS data from nineteen states, 51.1% (95% CI: 48.4, 53.9) of adults with current asthma reported sleep disturbance in the past 30 days.[3]

Figure 8. Asthma attacks in the past year - New Hampshire, 2002



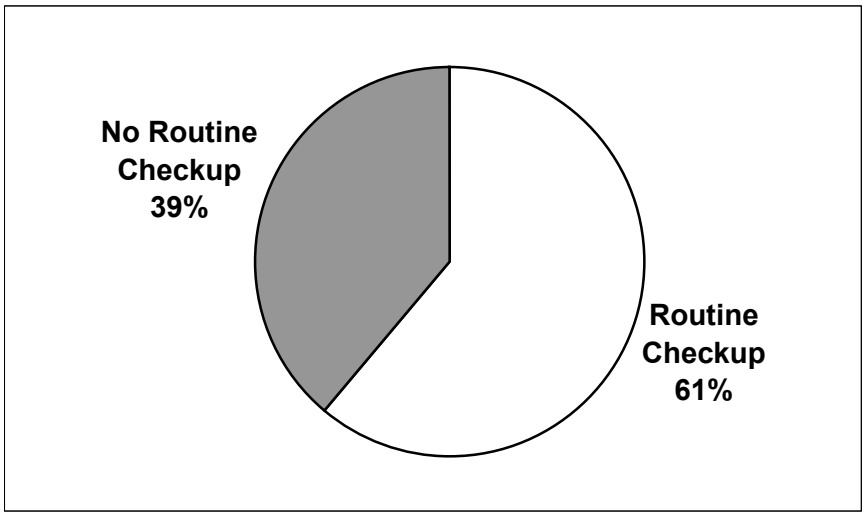
Comment: With proper care and management, individuals with asthma should have minimal or no recurrent attacks or episodes of asthma. In 2002, 54.1% (95% CI: 48.8, 59.5) of New Hampshire adults with current asthma said they had at least one asthma attack in the past year. According to combined BRFSS data from nineteen states, 52.0% (95% CI: 49.6, 54.3) of adults with asthma reported having at least one asthma attack.[3]

Figure 9. Activity limitation in the past year among adults with current asthma – New Hampshire, 2002



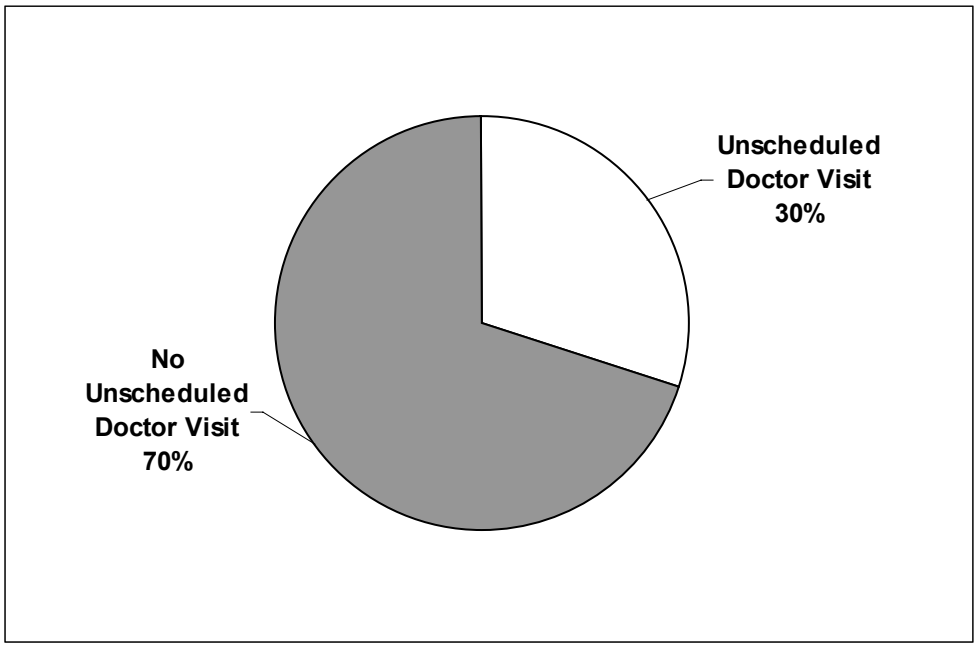
Comment: Another important goal for asthma therapy is no limitation on daily activities or missed days of school or work because of asthma. In 2002, 19.0% (95% CI: 14.7, 23.4) of New Hampshire adults with current asthma said there was at least one day in the preceding year when they were unable to work or carry out their usual activities because of asthma. Approximately 28.0% (95% CI: 25.6, 30.3) of adults with asthma from nineteen states reported activity limitation due to asthma in 2002.[3]

Figure 10. Routine checkups for asthma in the past year – New Hampshire, 2002



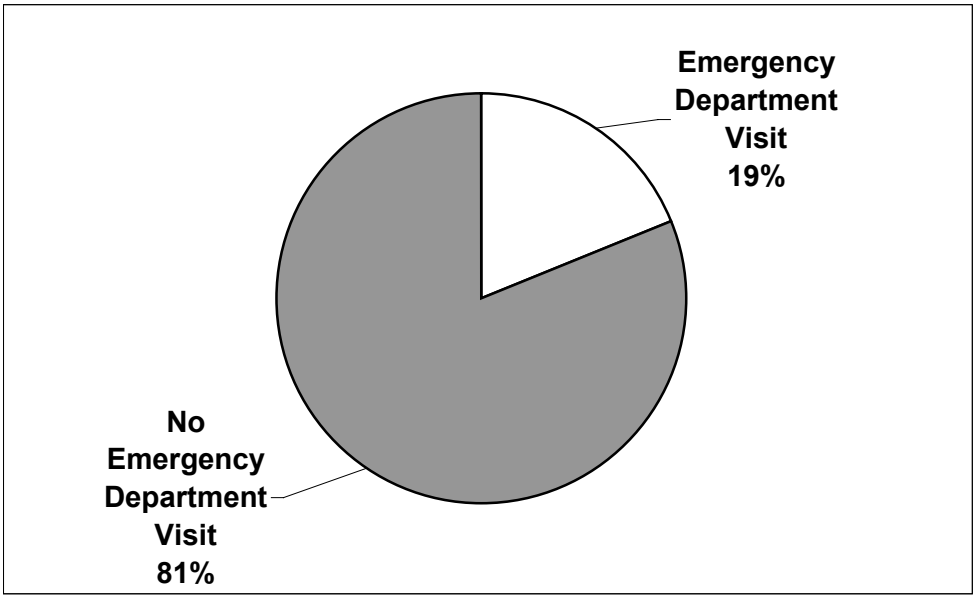
Comment: Asthma management guidelines issued by the National Asthma Education and Prevention Program (NAEPP) recommend routine medical checkups for asthma every one to six months, depending on disease severity and an individual's ability to maintain control of their symptoms.[7] In 2002, 61.2% (95% CI: 56.0, 66.3) of New Hampshire adults with current asthma reported they had at least one routine asthma checkup in the preceding 12 months. According to combined BRFSS data from nineteen states, 53.9% (95% CI: 51.6, 56.3) of adults with asthma had at least one asthma checkup in the past year.[3]

Figure 11. Unscheduled doctor visits for asthma in the past year – New Hampshire, 2002



Comment: If asthma is managed according to established guidelines, there should be minimal or no urgent, unscheduled visits to a doctor for asthma. In 2002, 29.7% (95% CI: 24.7, 34.7) of New Hampshire adults with current asthma reported at least one unscheduled doctor visit for asthma in the preceding year. In comparison, 28.5% (95% CI: 26.3, 30.8) of adults in nineteen states reported an unscheduled doctor visit for asthma.[3]

Figure 12. Emergency department visits for asthma in the past year – New Hampshire, 2002

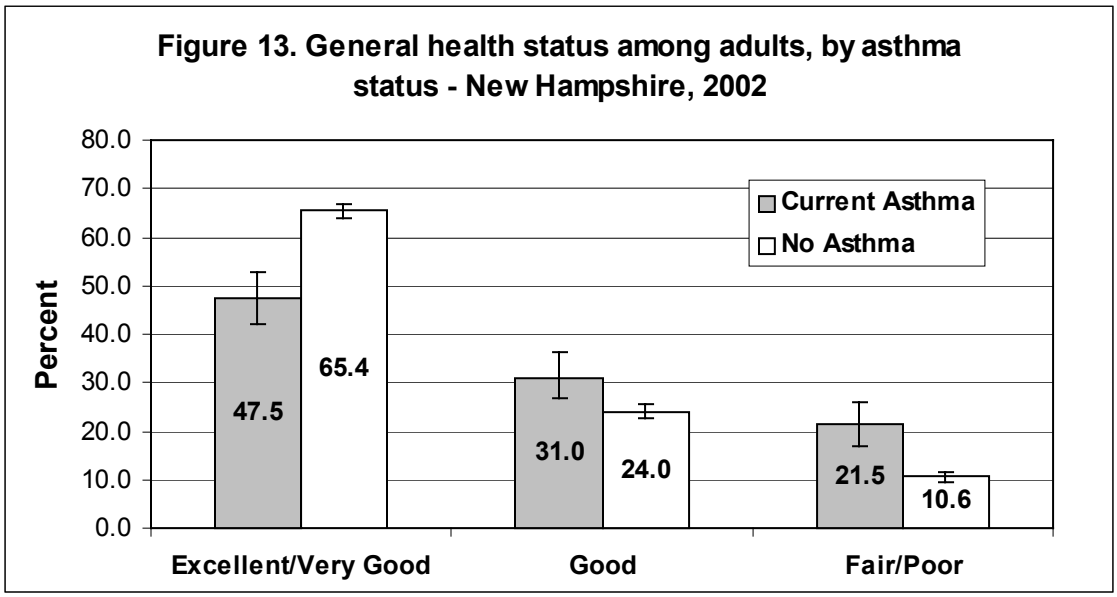


Comment: In 2002, 18.7% (95% CI: 14.3, 23.2) of New Hampshire adults with current asthma reported at least one emergency department visit for asthma in the preceding 12 months. According to combined BRFSS data from nineteen states, 18.4% (95% CI: 16.4, 20.4) of adults with asthma reported at least one emergency department visit for asthma.[3]

COMPARISONS BETWEEN ADULTS WITH AND WITHOUT CURRENT ASTHMA

Table 6. General health status among adults, by asthma status—New Hampshire, 2002

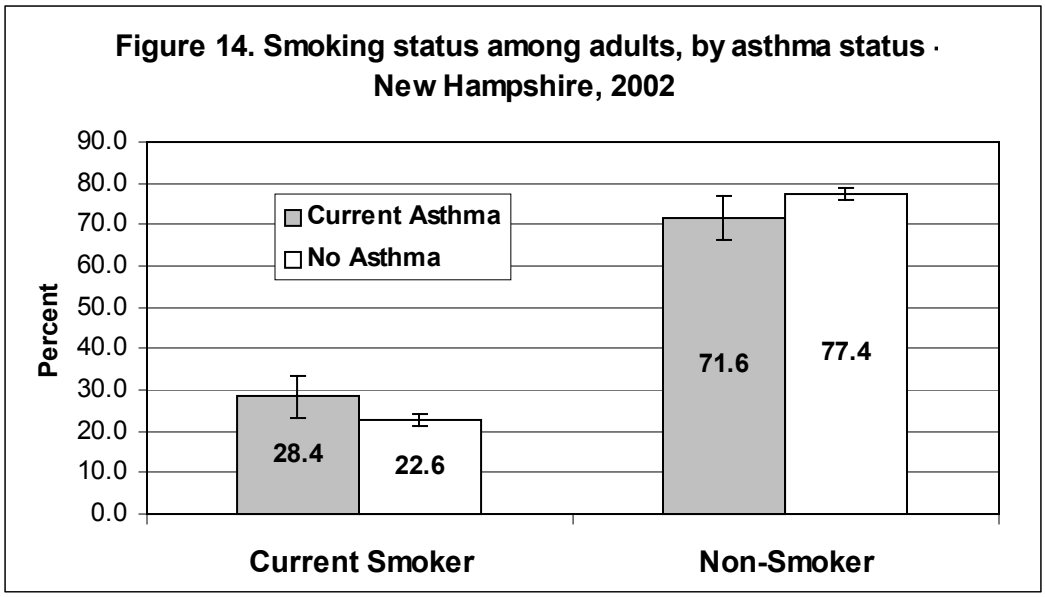
	Excellent/Very Good	Good	Fair/Poor
Asthma Status	N Percent (95% CI)	N Percent (95% CI)	N Percent (95% CI)
Current Asthma	215 47.5 (42.1, 52.9)	131 31.0 (25.8, 36.2)	98 21.5 (17.1, 25.9)
No Asthma	2972 65.4 (63.9, 67.0)	1069 24.0 (22.6, 25.4)	524 10.6 (9.5, 11.6)



Comment: In the 2002 BRFSS survey, all adult respondents were asked to rate their general health as excellent, very good, good, fair, or poor. Approximately 47.5% (95% CI: 42.1, 52.9) of New Hampshire adults with current asthma reported that their general health was excellent or very good, compared to 65.4% (95% CI: 63.9, 67.0) of adults who did not have asthma. An estimated 21.5% (95% CI: 17.1, 25.9) of adults with asthma reported fair or poor health, compared to only 10.6% (95% CI: 9.5, 11.6) of adults who did not have asthma. The difference between people with and without current asthma for each of the three categories of self-rated general health status was statistically significant.

Table 7. Smoking status among adults, by asthma status - New Hampshire, 2002

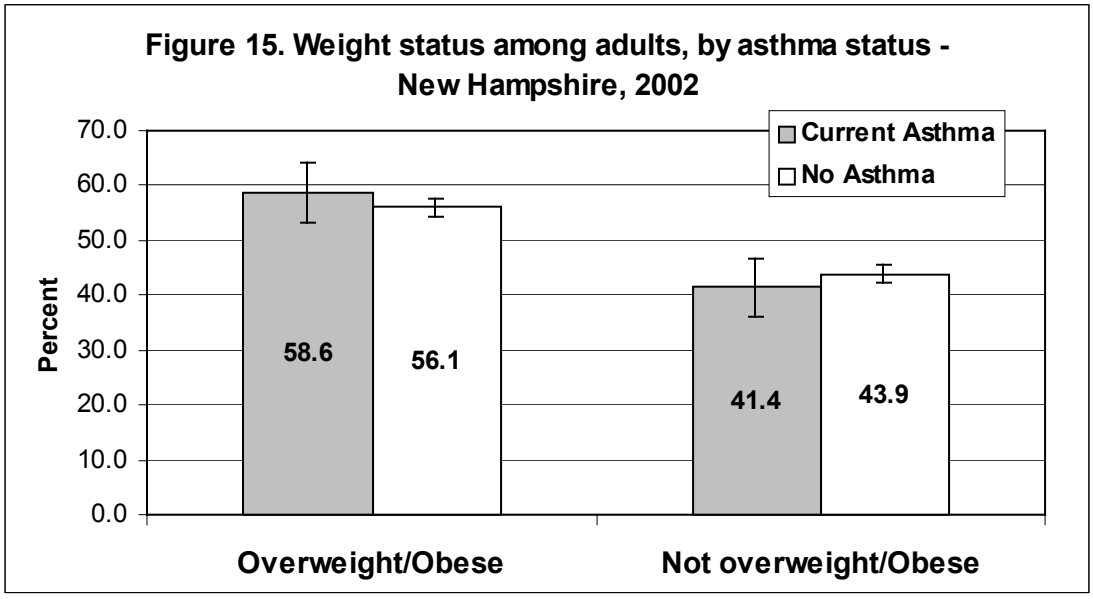
	Current Smoker	Non-Smoker
Asthma Status	N Percent (95% CI)	N Percent (95% CI)
Current Asthma	114 28.4 (23.2, 33.5)	331 71.6 (66.5, 76.8)
No Asthma	999 22.6 (21.2, 24.0)	3562 77.4 (76.0, 78.8)



Comment: Approximately 28.4% (95% CI: 23.2, 33.5) of adults with asthma were current smokers in 2002, compared to 22.6% (95% CI: 21.2, 24.0) of adults with no asthma. There were no statistically significant differences in smoking status between adults with current asthma and adults without asthma. A current smoker is defined as a survey respondent that had smoked at least 100 cigarettes in their lifetime and currently smokes every day or some days. The non-smoker category includes former smokers and those who have never smoked.

Table 8. Weight status among adults, by asthma status - New Hampshire, 2002

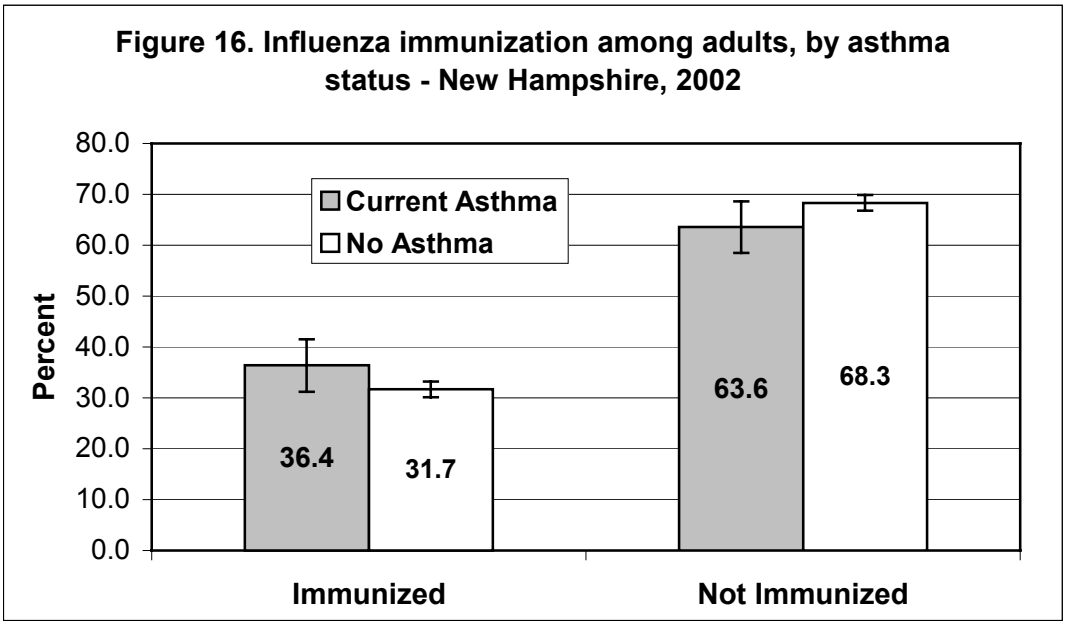
	Overweight/Obese	Not Overweight/Obese
Asthma Status	N Percent (95% CI)	N Percent (95% CI)
Current Asthma	245 58.6 (53.2, 64.0)	171 41.4 (36.0, 46.8)
No Asthma	2421 56.1 (54.4, 57.8)	1913 43.9 (42.2, 43.45.6)



Comment: Approximately 58.6% (95% CI: 53.2, 64.0) of respondents with current asthma were either overweight or obese, compared to 56.1% (95% CI: 54.4, 57.8) of adults with no asthma. This difference in weight status between adults with and without asthma was not statistically significant. Overweight/obese was defined as a body mass index (BMI) greater than or equal to 25. BMI is calculated by dividing weight (measured in kilograms) by height squared (measured in meters). BRFSS data on weight and height are self-reported.

Table 9. Influenza immunization status among adults, by asthma status - New Hampshire, 2002

	Immunized	Not Immunized
Asthma Status	N Percent (95% CI)	N Percent (95% CI)
Current Asthma	176 36.4 (31.2, 41.5)	268 63.6 (58.5, 68.6)
No Asthma	1512 31.7 (30.1, 33.2)	3053 68.3 (66.8, 69.9)



Comment: Upper respiratory tract infections like influenza are a common trigger of asthma and may cause significant morbidity and mortality among persons with asthma.[8] The Centers for Disease Control and Prevention recommend that individuals with asthma receive an annual vaccination for influenza.[9] In 2002, 36.4% (95% CI: 31.2, 41.5) of New Hampshire adults with current asthma said they had received an influenza vaccination in the past 12 months, compared to 31.7% (95% CI: 30.1, 33.2) of adults that did not have asthma. The difference in influenza vaccination status between people with and without asthma was not statistically significant.

According to data from the 2001 National Health Interview Survey, approximately 33.3% (95% CI: 31.6, 35.0) of U.S. adults with asthma had been vaccinated for influenza in the preceding 12 months, compared to 25.9% (95% CI: 25.3, 26.5) of adults without asthma.[8]

ASTHMA IN CHILDREN

Table 10. Percentage of adults that had a child with asthma— New Hampshire, 2002

	Percent (95% CI)
Ever told child had asthma	17.7 (15.7, 19.7)
Child still has asthma	68.6 (62.9, 74.3)

Comment: Information on childhood asthma from the 2002 BRFSS is based on adult responses. Respondents who reported that at least one child 17 or younger lived in their household were asked, "How many of these children have ever been diagnosed with asthma?" Adults who reported that at least one of the children in the household had been diagnosed with asthma were then asked "How many of these children still have asthma?"

In 2002, 17.7% (95% CI: 15.7-19.7) of New Hampshire adults had a child living in their household who had been diagnosed with asthma. There were no differences in the percentage of people who had a child in their household diagnosed with asthma among income or education groups. Approximately 68.6% (95% CI: 62.9-74.3) of adults who reported that they had a child in their household diagnosed with asthma said the child still had asthma.

II. INPATIENT HOSPITALIZATION FOR ASTHMA

Data on inpatient hospital stays for asthma can be used to examine the severity of asthma, both from the perspective of the individual and from the perspective of society. Approximately 475,000 hospitalizations for asthma occur each year in the United States.[2] In 1994--the most recent year for which national cost estimates are available- the total cost of asthma inpatient hospital care was approximately 1.8 billion dollars.[10] Most, if not all, hospitalizations for asthma can be prevented if the disease is managed according to established guidelines. As a result, public health action to reduce the number of hospitalizations for asthma can result in significant reductions in asthma morbidity and overall cost to society.

Due to the fact that asthma inpatient hospitalization rates measure a severe and relatively infrequent outcome of the disease, they are not useful indicators of asthma prevalence in the population. Hospitalization data are still a good source of information for asthma surveillance, however, because the information may help identify specific population groups at greater risk of significant morbidity and mortality due to asthma. Such groups can then be targeted for aggressive intervention to prevent hospitalization.

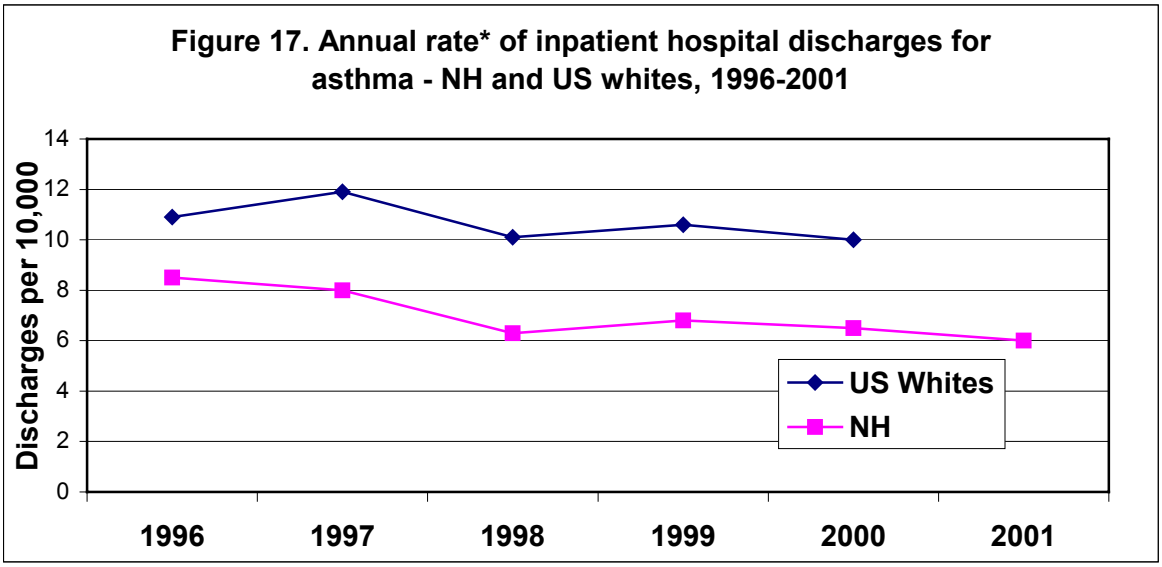
This section presents data on inpatient hospitalizations for asthma in New Hampshire from 1996 to 2001. It address questions such as: what is the annual number and rate of asthma hospitalizations, how have asthma hospitalization rates changed over time, and do asthma hospitalizations vary by gender, age group, or season of the year? New Hampshire data are compared to both state and national objectives for asthma hospitalization rates to assess our progress toward meeting these goals. In order to provide a more complete picture of the burden of asthma in the state, data on length of stay and charges associated with asthma hospitalizations are also included.

There is no confirmed asthma case classification for hospital discharge data. A probable case is defined as a hospital record listing asthma as the primary discharge diagnosis.[11] Since an individual may have multiple hospitalizations for asthma during any given time period, discharge data represent the number of *hospitalizations* rather than the number of *persons* hospitalized. For this report, an asthma hospitalization was defined as an inpatient hospital data set record of a New Hampshire resident listing asthma (ICD-9 CM code 493.0-493.9) as the principal discharge diagnosis. New Hampshire residents hospitalized in another state are not included in this data set; therefore, the true asthma-related hospitalization rate is probably higher.

Table 11. Annual number and rate* of inpatient hospital discharges for asthma as principal diagnosis--New Hampshire, 1996-2001

	1996	1997	1998	1999	2000	2001
Number	956	924	732	800	796	752
Crude Rate	8.2	7.9	6.2	6.7	6.4	6.0
Age-Adjusted Rate**	8.5	8.0	6.3	6.8	6.5	6.0
95% CI	7.9, 9.0	7.5, 8.5	5.9, 6.8	6.3, 7.2	6.0, 6.9	5.6, 6.5

*Rates are per 10,000 population.
**Age-adjusted to the 2000 US standard population.



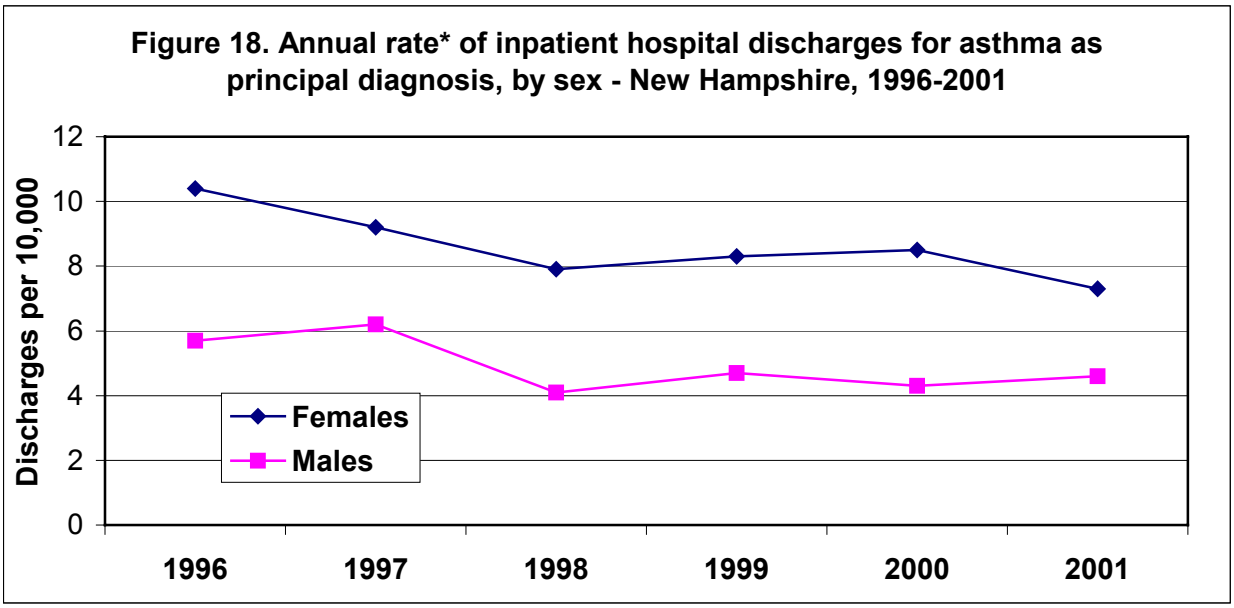
*Age-adjusted to the 2000 US standard population.

Comment: The age-adjusted rate of inpatient hospitalizations for asthma among New Hampshire residents was 6.0 per 10,000 in 2001. The asthma hospitalization rate was relatively stable from 1998-2001. Overall, New Hampshire asthma hospitalization rates were lower than US white rates from 1996-2000.

Table 12. Annual number and rate* of inpatient hospital discharges for asthma as principal diagnosis, by sex—New Hampshire, 1996-2001

	1996		1997		1998		1999		2000		2001	
Sex	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Male	323	5.7	357	6.2	238	4.1	274	4.7	261	4.3	279	4.6
Female	633	10.4	567	9.2	494	7.9	526	8.3	535	8.5	473	7.3
Total	956	8.5	924	8.0	732	6.3	800	6.8	796	6.5	752	6.0

*Rates are per 10,000 population and age-adjusted to the 2000 US standard population.



*Age-adjusted to the 2000 US standard population.

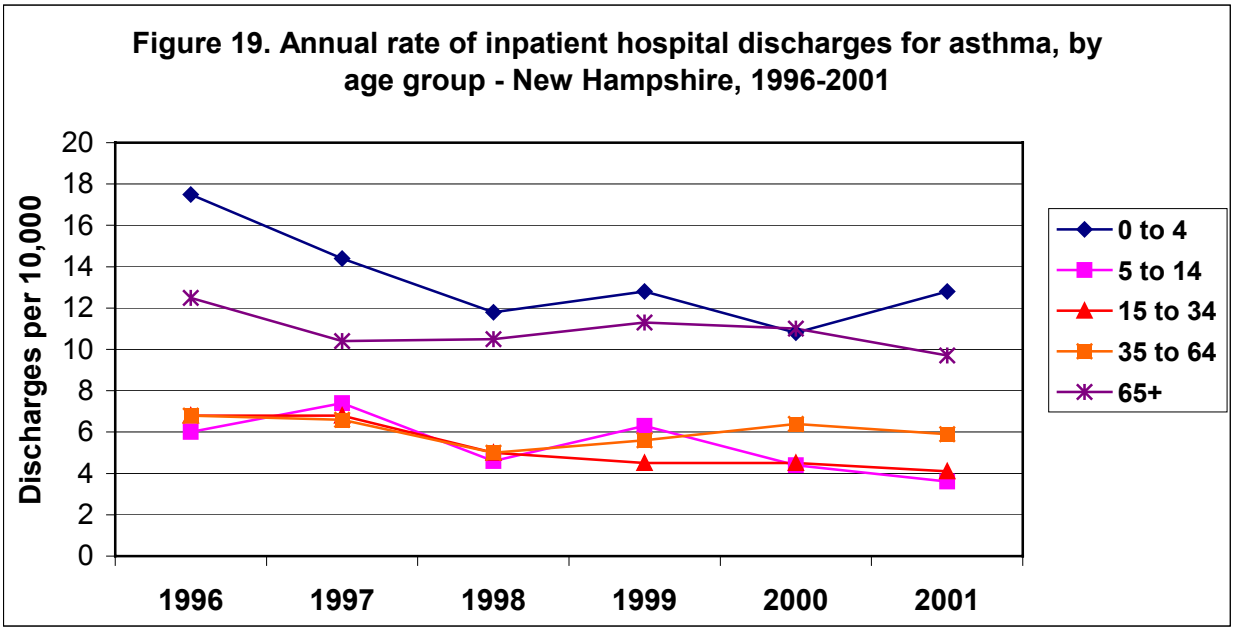
Comment: Females have a higher rate of inpatient hospitalization for asthma than males, both in New Hampshire and nationally. In 2001, the rate for females was 7.3 per 10,000 versus 4.6 per 10,000 for males. This pattern of gender difference in asthma hospitalizations has been consistent over time; female rates exceeded male rates each year from 1996 to 2001.

Table 13. Annual number and rate* of inpatient hospital discharges for asthma as principal diagnosis, by age group—New Hampshire, 1996-2001

	1996		1997		1998		1999		2000		2001	
Age Group	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**
0-4	139	17.5	113	14.4	91	11.8	98	12.8	82	10.8	98	12.8
5-14	102	6.0	128	7.4	81	4.6	112	6.3	80	4.4	66	3.6
15-34	229	6.8	225	6.8	163	5.0	145	4.5	141	4.5	132	4.1
35-64	312	6.8	312	6.6	246	5.0	280	5.6	331	6.4	311	5.9
≥65	174	12.5	146	10.4	151	10.5	165	11.3	162	11.0	145	9.7
Total	956	8.5	924	8.0	732	6.3	800	6.8	796	6.5	752	6.0

*Rates are per 10,000 population.

Figure 19. Annual rate of inpatient hospital discharges for asthma, by age group - New Hampshire, 1996-2001



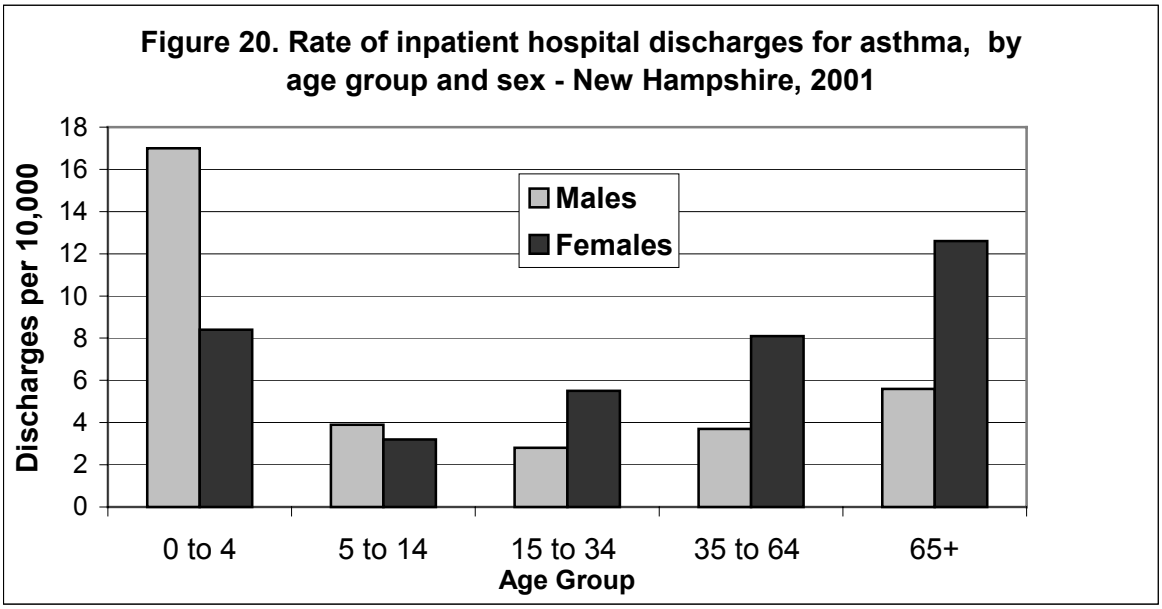
Comment: Rates of inpatient hospitalization for asthma in New Hampshire are highest among children 0 to 4 years of age and adults 65 years of age and older. The relatively high rates of hospitalization for asthma among adults aged 65 and older may be partly explained by the fact that older individuals are more likely to have other conditions such as chronic obstructive pulmonary disease (COPD) that may be incorrectly classified as asthma on the hospital discharge record.

Nationally, children aged 0 to 4 have the highest rates of hospitalization for asthma.

Table 14. Number and rate* of inpatient hospital discharges for asthma as principal diagnosis, by age group and sex—New Hampshire, 2001

	0 to 4		5 to 14		15 to 34		35 to 64		65+	
Sex	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**
Male	67	17.0	37	3.9	44	2.8	96	3.7	35	5.6
Female	31	8.4	29	3.2	88	5.5	215	8.1	110	12.6

*Rates are per 10,000 population.



Comment: The likelihood of hospitalization for asthma varied considerably by both age and gender. Males aged 0 to 14 had higher rates of asthma hospitalization than females. Females had higher rates after age 14, and the difference between male-female rates increased with age. This age-gender difference has been shown in numerous studies and is more readily apparent with severe outcomes of asthma (e.g., hospitalization and death).[12]

Table 15. Comparison of New Hampshire inpatient hospitalization rates* and 2010 objectives, by age group

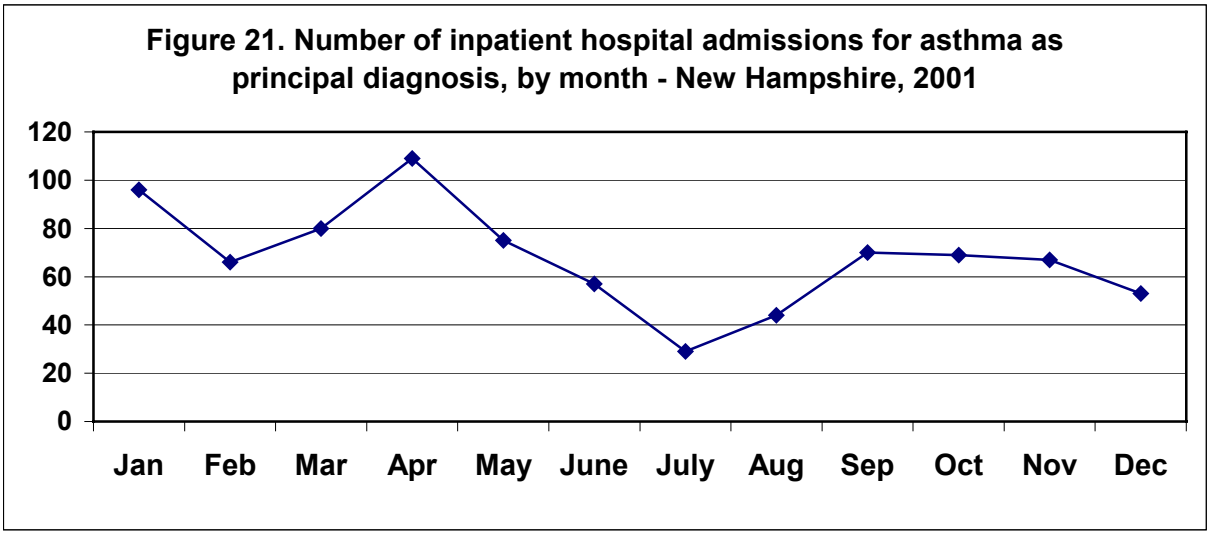
	2001 NH Rate	2010 Target
Age Group		**US Healthy People**
0 to 4	12.8	25
5 to 64	4.9	7.7
≥65	9.7	11
		Healthy NH
0 to 17	8.8	7.9

*Rates are per 10,000 population.

Comment: Both the US Healthy People 2010 and Healthy New Hampshire 2010 initiatives include objectives that address hospitalization for asthma. Healthy People 2010 Objective 24-2 is to reduce asthma hospitalizations to 25 per 10,000 among children 0 to 4 years of age, 7.7 per 10,000 among persons aged 5 to 64, and 11 per 10,000 among persons 65 and older.[13] These target rates use hospitalizations with a primary discharge diagnosis of asthma for the numerator and resident population from the US Census for the denominator.

Healthy New Hampshire 2010 includes an objective to reduce hospitalizations for pediatric asthma to 7.9 per 10,000. This target rate uses hospitalizations with either a primary discharge diagnosis of asthma (ICD-9 code 493) OR a primary discharge diagnosis of a respiratory condition (ICD-9 codes 460-496.9) with asthma as a second or third-listed diagnosis for the numerator. Pediatric asthma hospitalizations are defined as those that occur among persons 0 to 17 years of age.[14] The pediatric asthma hospitalization rate in 2001 was 8.8 per 10,000. Efforts to ensure that asthma hospitalization rates among New Hampshire residents of all ages remain at or below target rates, and to decrease these rates even further, are needed in the coming years. A complete list of asthma-related Healthy People 2010 and Healthy New Hampshire 2010 objectives can be found in Appendix B.

SEASONAL VARIATION IN ASTHMA HOSPITALIZATIONS



Comment: The number of hospitalizations for asthma in New Hampshire fluctuates over the course of a year. The largest number of hospitalizations tends to occur between January and April and the smallest number from June to August. This seasonal pattern was consistent over the period 1996-2001, and has also been documented in other states.[15,16] In 2001, there were 102 inpatient hospital admissions for asthma in January, compared to only 29 asthma hospital admissions in July. Hospitalization for asthma may be higher during the winter and spring months for several reasons, including the presence of seasonal allergens such as pollen; increased amounts of time spent indoors with exposure to potential triggers such as dust mites, mold, animal dander, and environmental tobacco smoke; and greater frequency of upper respiratory infections.[17]

Table 16. Charges and length of stay (LOS) for asthma inpatient hospitalizations— New Hampshire, 1996-2001

	1996 (N=956)	1997 (N=924)	1998 (N=732)	1999 (N=800)	2000 (N=796)	2001 (N=752)
Charges (dollars*)						
Mean	4535	4508	4757	4971	5203	5599
Median	3447	3510	3634	3850	4095	4356
	4,335,149	4,165,209	3,481,980	3,976,751	4,141,661	4,210,196
Mean	3.5	3.1	3.2	3.1	3.1	3.2
Median	3.0	2.0	3.0	2.0	2.0	2.0
Total	3318	2878	2350	2476	2436	2412

*Unadjusted dollars

Comment: In 2001, there were 752 inpatient hospitalizations for asthma, resulting in 2,412 hospital days and total charges of approximately 4.2 million dollars. The mean length of stay for an asthma hospitalization was 3.2 days and the median charge was $4,356.

Charges for inpatient hospital services represent just one component of direct medical expenditures for asthma. Direct medical expenditures also include charges for outpatient/emergency department hospital services, physician services, and medications. The cost of inpatient hospital care for asthma is significantly higher than for outpatient care; as a result, hospitalizations typically constitute a sizable portion of total direct costs.

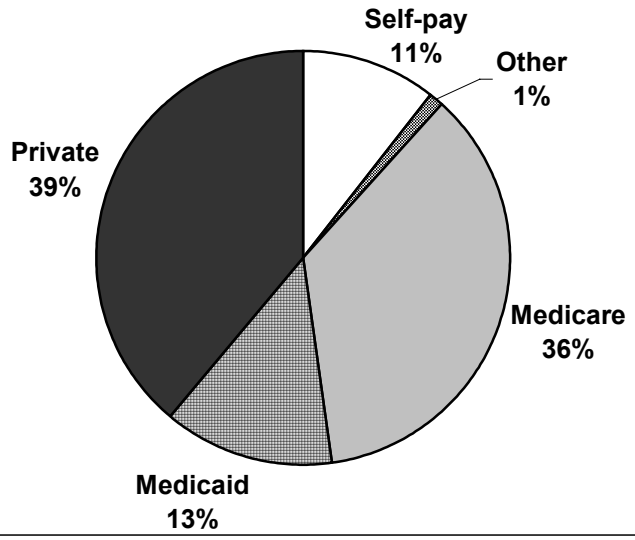
In 1998, the estimated total cost of asthma in New Hampshire was 46 million dollars. Total cost was composed of 26 million dollars in direct medical expenditures and 20 million dollars in indirect costs.[4] Indirect costs of asthma include non-medical economic losses such as days missed from school or work, caregiver costs, travel costs, early retirement due to disability, and years of productive life lost due to premature death.[1]

Table 17. Asthma inpatient hospitalization charges, by primary payor—New Hampshire, 2001

	Number of hospitalizations	Total charges (dollars*)	Percent of total charges
Payor			
Self-pay	82	440,314	10.5
Private insurance	357	1,642,695	39.0
Medicaid	111	552,925	13.1
Medicare	194	1,520,485	36.1
Other	8	53,777	1.3
Total	752	4,210,196	100

*Unadjusted dollars

Figure 22. Distribution of asthma inpatient hospitalization charges by primary payor - New Hampshire, 2001



Comment: A primary payor is the principal source from which a hospital expects to receive payment for charges incurred from a hospitalization. The information on primary payor in the New Hampshire inpatient hospital data set is divided into eleven categories. For the purposes of this analysis, these were grouped into the following five categories: Private (HMO, Blue Cross, or commercial insurance), Medicaid (Medicaid or Medicaid Managed Care), Medicare (Medicare or Medicare Managed Care), Self-pay, and Other (Worker's Compensation, Other government, or Other).

In 2001, private insurance was the expected primary payor for 39.0% of all inpatient hospital charges in New Hampshire. Medicare was the primary payor for 36.1% of hospital charges that year, with total charges of approximately 1.5 million dollars. Medicaid accounted for 13.1% of all charges and self-pay accounted for 10.5%.

III. EMERGENCY DEPARTMENT VISITS FOR ASTHMA

There were approximately 1.8 million emergency department visits for asthma in the United States in 2000, a rate of 67 per 10,000 people.[18] In 1994--the most recent year for which national cost estimates are available--the total cost of emergency department services for asthma was approximately 479 million dollars.[10] Similar to inpatient hospitalization data, emergency department visit data can be used to examine the severity of asthma, both in terms of morbidity among individuals with asthma and overall cost to society. Management of asthma according to established guidelines can prevent most emergency department visits for the disease.

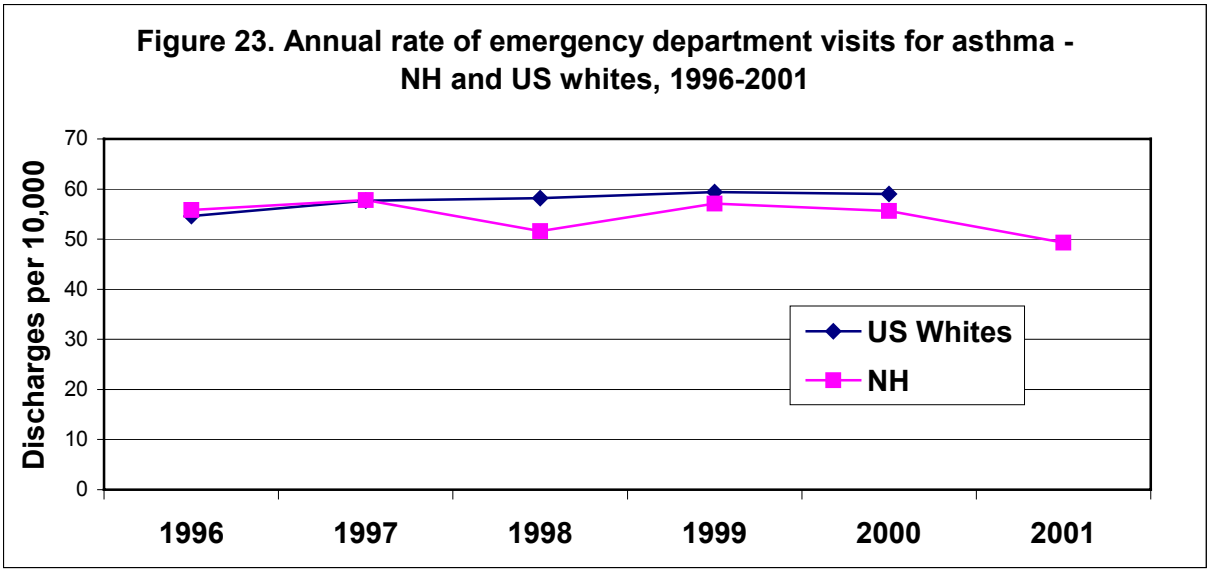
This section presents data on emergency department visits for asthma in New Hampshire from 1996 to 2001. It address questions such as: what is the annual number and rate of asthma emergency department visits, how have emergency department visit rates changed over time, and do emergency department visits vary by gender, age group, or season of the year? New Hampshire data are compared to national objectives for asthma emergency department visit rates to assess our progress toward meeting these goals. Data on length of stay and charges associated with asthma emergency department visits are also included in order to provide a more complete picture of asthma's impact in the state.

There is no confirmed asthma case classification for emergency department data. A probable case is defined as an emergency department record listing asthma as the primary discharge diagnosis.[11] An individual may have multiple emergency department visits for asthma during any given time period, discharge data represent the number of *visits* rather than the number of *persons* who sought care for asthma in the emergency department. For this report, an asthma emergency department visit was defined as an outpatient hospital data set record of a New Hampshire resident listing asthma (ICD-9 CM code 493.0-493.9) as the principal discharge diagnosis. New Hampshire residents that received care at an emergency department in another state are not included in the outpatient hospital data set.

Table 18. Annual number and rate* of emergency department discharges for asthma as principal diagnosis—New Hampshire, 1996-2001

	1996	1997	1998	1999	2000	2001
Number	6485	6795	6136	6853	6793	6096
Crude Rate	55.9	57.9	51.8	57.1	55.0	48.6
Age-Adjusted Rate**	55.8	57.8	51.6	57.1	55.6	49.3
95% CI	54.4-57.2	56.4-59.2	50.3-52.9	55.8-58.5	54.3-56.9	48.1,50.6

*Rates are per 10,000 population.
**Age-adjusted to the 2000 US standard population.



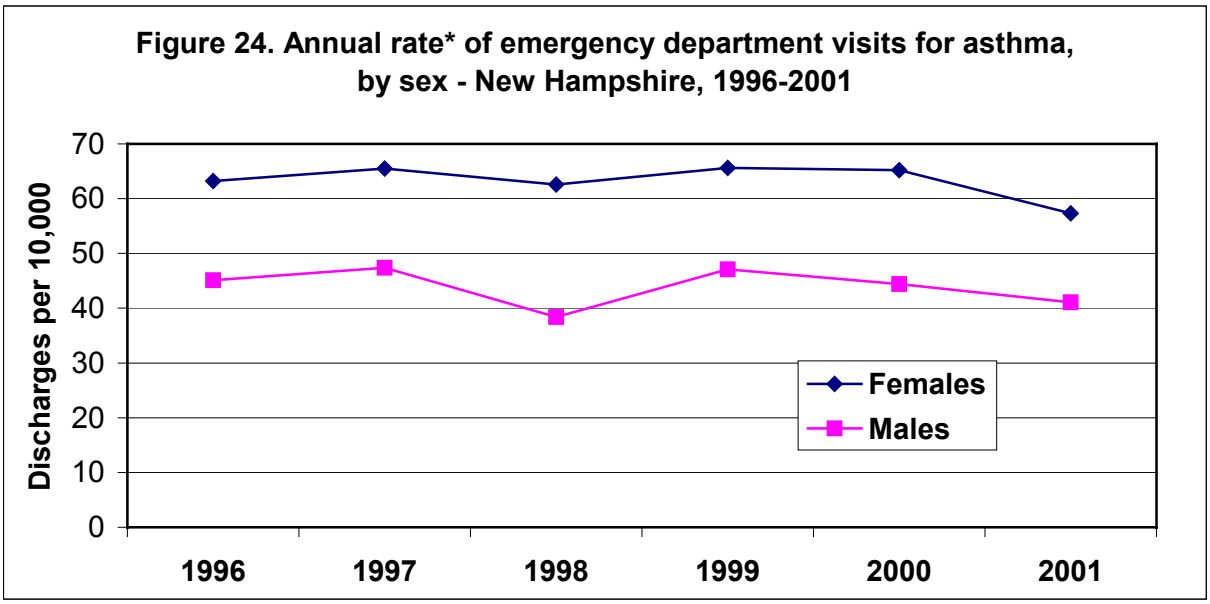
*Age-adjusted to the 2000 US standard population.

Comment: The age-adjusted rate of emergency department visits for asthma among New Hampshire residents was 49.3 per 10,000 in 2001. New Hampshire rates were slightly lower than US white rates from 1998-2000.

Table 19. Annual number and rate* of emergency department discharges for asthma as principal diagnosis, by sex—New Hampshire, 1996-2001

	1996		1997		1998		1999		2000		2001	
Sex	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**
Male	2671	45.1	2819	47.4	2301	38.4	2833	47.1	2699	44.4	2504	40.6
Female	3814	63.2	3976	65.5	3835	62.6	4020	65.6	4094	65.2	3592	56.3
Total	6485	55.8	6795	57.8	6136	51.6	6853	57.1	6793	55.6	6096	49.3

*Rates are per 10,000 population and age-adjusted to the 2000 US standard population.



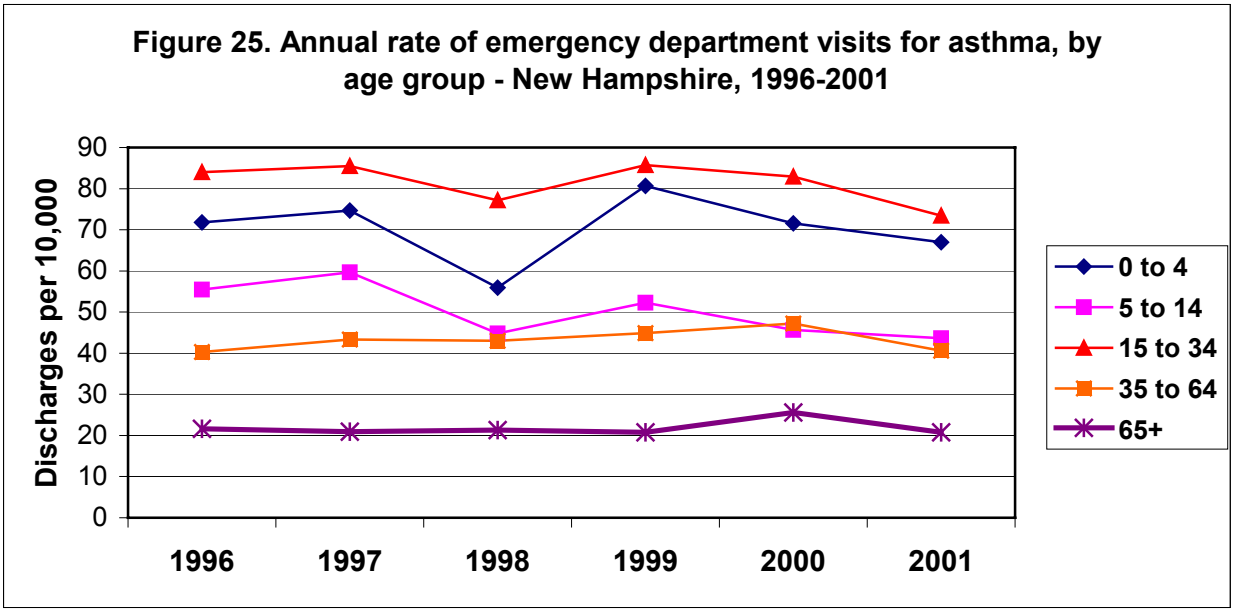
*Age-adjusted to the 2000 US standard population.

Comment: Females have a higher rate of emergency department visits for asthma than males, both in New Hampshire and nationally. This gender difference is also seen in data on inpatient hospitalization and death from asthma. In 2001, the rate of asthma emergency department visits for New Hampshire females was 56.3 per 10,000, versus 40.6 per 10,000 for New Hampshire males. The difference between the male and female rates has been consistent over time, with female rates about 30% higher than male rates each year from 1996-2001.

Table 20. Annual number and rate* of emergency department discharges for asthma as principal diagnosis, by age group—New Hampshire, 1996-2001

	1996		1997		1998		1999		2000		2001	
Age Group	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**
0-4	569	71.8	585	74.7	433	55.9	618	80.7	542	71.6	511	67.0
5-14	943	55.5	1032	59.7	788	44.8	935	52.3	830	45.7	802	43.6
15-34	2812	84.0	2824	85.5	2511	77.2	2745	85.7	2616	82.9	2337	73.4
35-64	1862	40.3	2059	43.3	2099	43.0	2252	44.9	2427	47.2	2135	40.6
≥65	299	21.6	295	20.9	305	21.3	303	20.8	378	25.6	311	20.8
Total	6485	55.8	6795	57.8	6136	51.6	6853	57.1	6793	55.6	6096	49.3

*Rates are per 10,000 population.



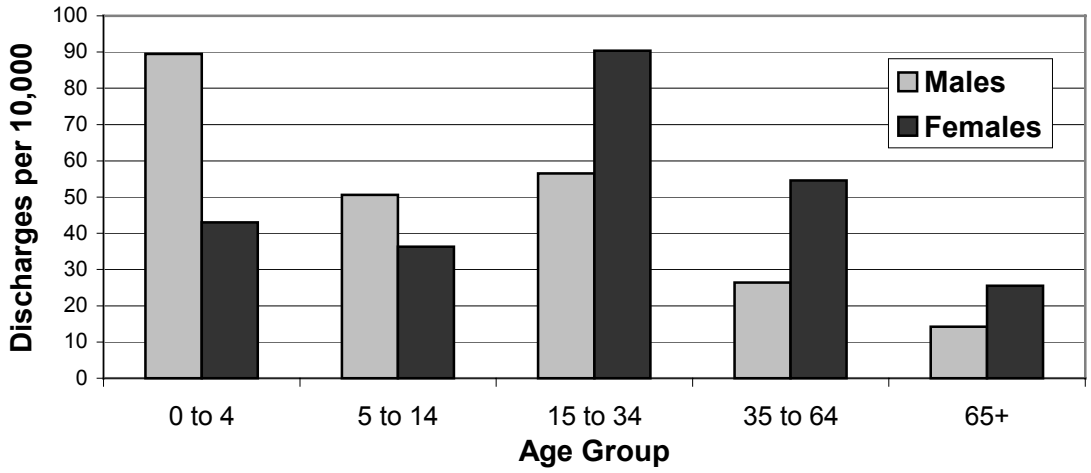
Comment: New Hampshire residents aged 0 to 4 and 15 to 34 years of age had the highest rates of emergency department visits for asthma in 2001, 67.0/10,000 and 73.4/10,000 respectively. Nationally, children 0 to 4 have the highest rates of asthma emergency department visits, and rates decrease with increasing age.[2]

Table 21. Number and rate* of emergency department discharges for asthma as principal diagnosis, by age group and sex—New Hampshire, 2001

	0 to 4		5 to 14		15 to 34		35 to 64		65+	
Sex	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**	**N**	**Rate**
Male	352	89.5	475	50.6	898	56.5	690	26.4	89	14.2
Female	159	43.0	327	36.3	1439	90.4	1445	54.6	222	25.5

*Rates are per 10,000 population.

Figure 26. Rate of emergency department discharges for asthma, by age group and sex - New Hampshire, 2001



Comment: The rate of emergency department visits for asthma varied considerably by both age and gender. From age 0 to 14, New Hampshire males had higher rates of asthma emergency department visits than New Hampshire females. After age 14, females had higher rates. This age-gender difference is also seen in data on inpatient hospitalizations for asthma. In 2001, the emergency department visit rate for females peaked at age 15 to 34 and then declined with age. Among males, children 0 to 4 years of age had the highest rate of emergency department visits for asthma.

Table 22. Comparison of New Hampshire emergency department visit rates* and 2010 objective, by age group

	2001 NH Rate	2010 Objective 24-3
Age Group		
<5	67.0	80
5 to 64	51.3	50
≥65	20.8	15

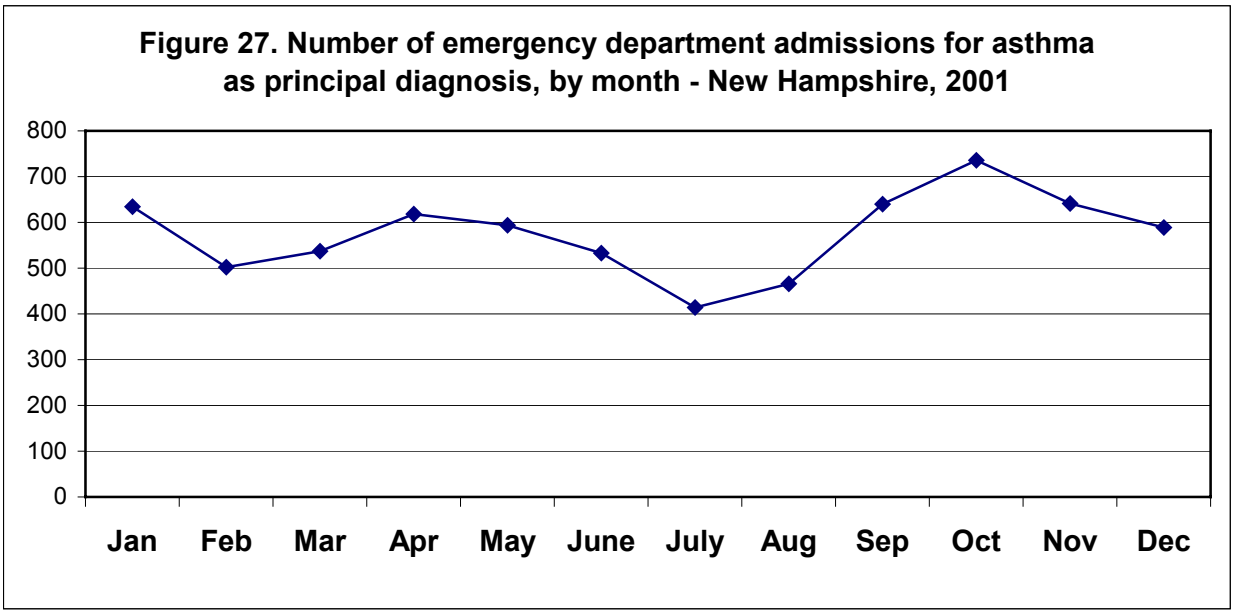
*Rates are per 10,000 population.

Comment: Emergency department visits for asthma are the basis of a national objective for asthma in Healthy People 2010. This objective uses emergency department visits with a primary discharge diagnosis of asthma (ICD-9-CM code 493.0-493.9) for the numerator and resident population from the US Census for the denominator. Objective 24-3 calls for a reduction of emergency department visits for asthma to 80 per 10,000 in children under age 5, 50 per 10,000 in persons aged 5 to 64 years, and 15 per 10,000 in persons aged 65 and older.

New Hampshire rates for persons 5 to 64 and 65 and older were higher than the corresponding 2010 targets, indicating areas where progress needs to be made in the coming years.

A complete list of asthma-related Healthy People 2010 objectives can be found in Appendix B.

SEASONAL VARIATION IN EMERGENCY DEPARTMENT VISITS FOR ASTHMA



Comment: The number of emergency department admissions for asthma in New Hampshire tends to vary over the course of the year, with peaks during the spring and fall seasons and a decline in the summer. In 2001, there were 736 emergency department visits for asthma in October, compared to 414 in July. A similar seasonal pattern is seen in data on inpatient hospitalizations for asthma. Rates of inpatient and emergency department visits for asthma may be higher during the spring, fall and winter months due to seasonal allergies; increased exposure to indoor air triggers such as dust, mold, pet dander, and environmental tobacco smoke; and greater likelihood of developing an upper respiratory infection that may exacerbate asthma.[17]

Table 23. Charges for asthma emergency department visits—New Hampshire, 1996-2001

	1996 (N=6485)	1997 (N=6795)	1998 (N=6136)	1999 (N=6853)	2000 (N=6793)	2001 (N=6096)
Charges (dollars*)						
Mean	416	410	452	464	487	473
Median	306	301	325	342	358	398
Total	2,695,971	2,783,508	2,770,292	3,176,176	3,306,318	2,880,873

*Unadjusted dollars

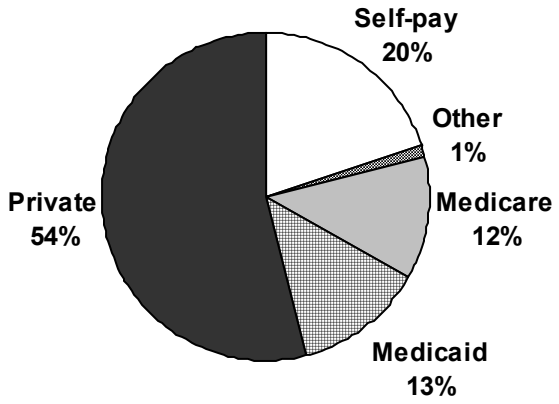
Comment: There were 6,096 emergency department visits for asthma in New Hampshire in 2001, resulting in approximately 2.9 million dollars in charges. The median charge for an asthma emergency department visit was $398 in 2001.

Table 24. Asthma emergency department visit charges, by primary payor—New Hampshire, 2001

	Number	Total charges (dollars*)	Percent of total charges
Payor			
Self-pay	1252	561,113	19.5
Private insurance	3323	1,560,312	54.2
Medicaid	877	383,145	13.3
Medicare	550	339,295	11.8
Other	94	37,008	1.3
Total	6096	2,880,873	100

*Unadjusted dollars

Figure 28. Distribution of asthma emergency department charges by primary payor - New Hampshire, 2001



Comment: Private insurance (e.g., HMO or Blue Cross) was the primary source of payment for 54.2% of all emergency department charges in 2001. Medicaid and Medicare each accounted for 13.3% and 11.8% of emergency department visit charges, respectively. Approximately 19.5% of charges were classified as self-pay. The self-pay category may represent the underinsured or uninsured population in New Hampshire because these individuals, who generally lack regular access to primary care or pharmacological services, must often use emergency departments as their main or sole source of medical care for asthma in times of need.

IV. MORTALITY FROM ASTHMA

There were 4,487 deaths from asthma in the United States in 2000, including eighteen among New Hampshire residents.[18] Asthma deaths are uncommon events, especially among young people. As with hospitalizations and emergency department visits, asthma deaths are more likely to occur in females. Nationally, this gender difference in mortality has grown over the past two decades; asthma mortality rates between 1980 and 1999 decreased by 11% among males, but increased 42% among women.[17]

This section presents information on deaths from asthma in New Hampshire from 1990 to 2001. It includes data on the number and rate of asthma deaths during this time period. Annual death counts for males and females are also included. It was not possible to determine whether asthma mortality rates varied by gender, age, or geographic location due to the small number of deaths in each population subgroup during this time period.

For this report, an asthma death was defined as a New Hampshire resident death record listing asthma as the underlying cause of death. Death data were coded under the Ninth Revision of the International Classification of Diseases (ICD-9) from 1990-1998; a diagnosis code of 493.0-493.9 was used to identify asthma deaths during these years. ICD Revision 10 was implemented in 1999; therefore, the ICD-10 asthma diagnosis codes J-45 and J-46 were used to identify asthma deaths that occurred from 1999-2001.

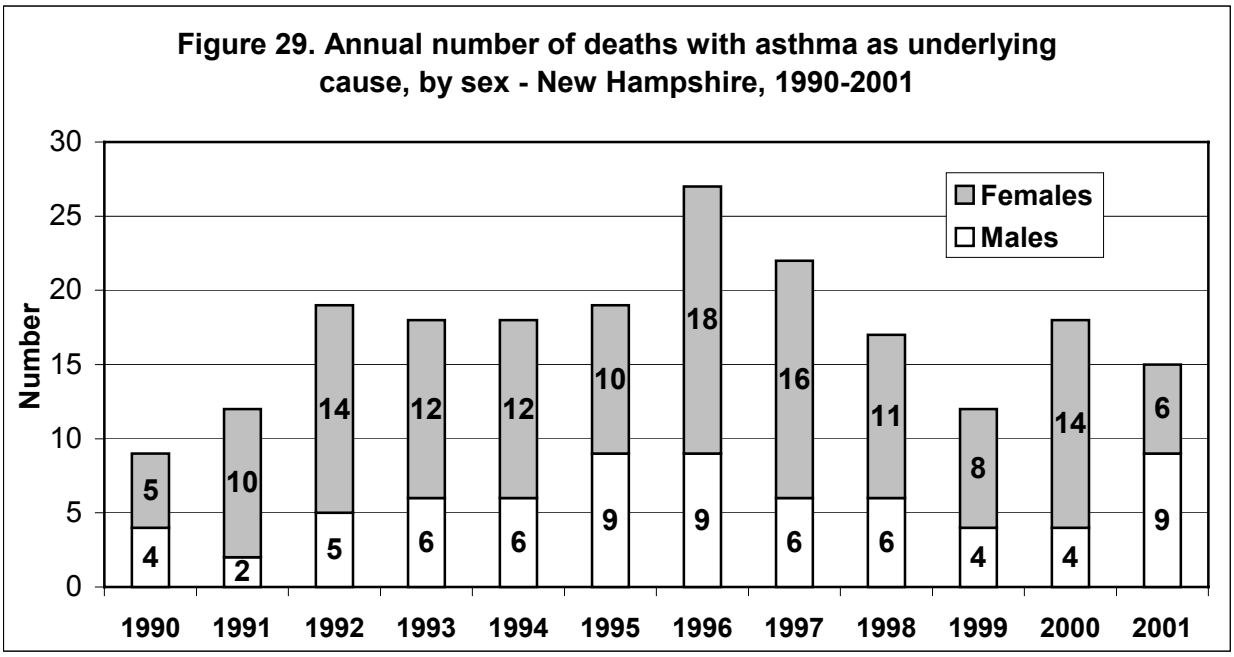
The mortality data from 1999-2001 cannot be directly compared with the data from previous years due to the change in coding system from ICD-9 to ICD-10. In order to account for the effect of implementing ICD-10 on mortality statistics, comparability ratios for selected causes of death were calculated by the National Center for Health Statistics, National Vital Statistics System. The comparability ratio for asthma is 0.8938. This means that changes in the selection and grouping of underlying causes of death under ICD-10 reduced the possibility of asthma being coded as the underlying cause of death by about 11%.

Comparability ratios may be applied to the number and rate of deaths that occurred prior to 1999 in order to adjust for the introduction of ICD-10. In this report, the comparability ratio has been applied to New Hampshire asthma mortality rate data from 1990-1998. Asthma death count data were not adjusted using the comparability ratio in order to present the actual number of deaths per year.

Table 25. Annual number of deaths with asthma as underlying cause of death, by sex— New Hampshire, 1990-2001*

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Males	4	2	5	6	6	9	9	6	6	4	4	9
Females	5	10	14	12	12	10	18	16	11	8	14	6
Total	9	12	19	18	18	19	27	22	17	12	18	15

*Cause of death coding converted from ICD-9 to ICD-10 in 1999.

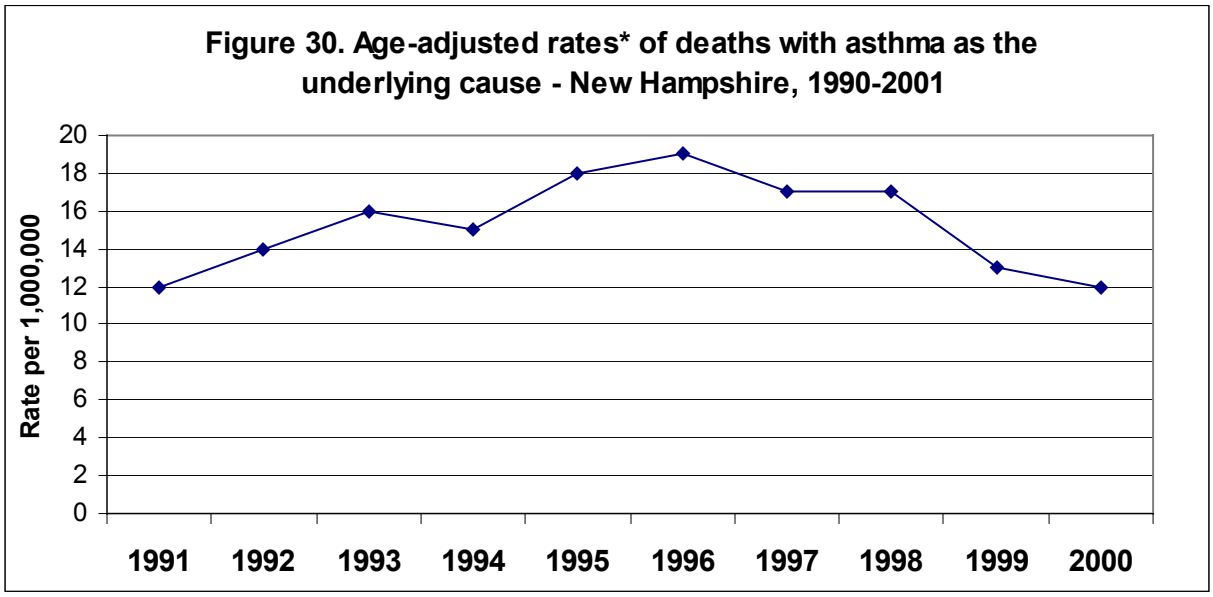


Comment: There were a total of 206 deaths of New Hampshire residents from asthma over the period 1990-2001. Approximately two-thirds (136) of all deaths were among female residents. Nationally, the number of asthma deaths in females is about one and a half times the number in males.[2] In 2001, there were 15 deaths from asthma. The comparability ratio for asthma was not applied to New Hampshire data on annual death counts in order to present the actual number of deaths that occurred each year. As a result, trends in asthma death counts over time should be interpreted with caution.

Table 26. Age-adjusted rates* of death with asthma as underlying cause—New Hampshire, 1990-2001

	1990-1992	1991-1993	1992-1994	1993-1995	1994-1996	1995-1997	1996-1998	1997-1999	1998-2000	1999-2001
Number	40	49	55	55	64	68	66	61	47	45
Rate	12	14	16	15	18	19	17	17	13	12

*Rates per 1,000,000. Comparability ratio applied to account for coding conversion from ICD-9 to ICD-10 in 1999.



*Age-adjusted to the 2000 US standard population. Three-year rolling average rates displayed at midpoint year.

Comment: Due to the relatively small number of asthma deaths per year, reliable annual mortality rates for 1990-2001 could not be calculated. As a result, years of data were combined and New Hampshire rates were calculated as three-year rolling averages. These rates were calculated using the number of deaths and the total population for each year included in the three-year span. New Hampshire rolling average rates for 1990-2001 are displayed at the midpoint year.

Table 27. Comparison of New Hampshire asthma mortality rates 1990-2000 and Healthy People 2010 objective, by age group

Age Group	Number of deaths	NH Death Rate* 1990-2000	2010 Objective
0 to 4	0	-	1.0
5 to 14	2	-	1.0
15 to 34	9	-	3.0
35 to 64	63	12.8	9.0
≥65	117	77.9	60.0

*Rates are per 1,000,000. Rates are not displayed if fewer than 20 events were reported (noted as -).

Comment: Healthy People 2010 includes an objective to reduce mortality from asthma to one death per million among children 0 to 4 and 5 to 14 years of age, three per million among persons 15-34 years of age, nine per million among persons 35-64, and 60 per million among persons 65 and older. Age-specific asthma mortality rates for New Hampshire residents could only be calculated for the two oldest age groups due to the small number of deaths among persons less than 35 years of age. Approximately 61% of all asthma deaths from 1990-2000 occurred among persons aged 65 and older. Mortality rates were calculated using the total number of asthma deaths in each age group for the period 1990-2000 for the numerator and the midpoint year (1995) age-specific population multiplied by the number of years in the range (11) for the denominator.

The 1990-2000 asthma mortality rates for New Hampshire adults 35-64 and ≥65 were higher than Healthy People 2010 target rates for these age groups. Relatively high asthma mortality rates among older adults may be partly due to the difficulty of distinguishing asthma from other chronic lung diseases in persons 35 and older.

CONCLUSIONS

Asthma is an important and growing public health problem in the United States. Data from the 2002 Behavioral Risk Factor Surveillance System indicate that 8.7% of New Hampshire adults currently have asthma. Results from the survey's Adult Asthma History module provide a new source of information on health care utilization, attack prevalence, number of school or work days missed, activity limitations, and medication use among persons with asthma in the state. The information contained in this report is the most current and comprehensive picture of asthma in New Hampshire to date. It is a resource that can be used to monitor asthma trends over time and evaluate efforts to reduce the burden of asthma in the state.

Future reports on asthma in New Hampshire will include additional data from these and other sources. The Asthma Control Program is currently working to expand its surveillance system to track asthma illness and disability, asthma prevalence in children, the impact of environmental factors on asthma, asthma management, access to care, and health care utilization among persons with asthma. Data from new sources like Medicaid, Medicare, private insurers, indoor and outdoor air quality monitoring projects, and school asthma surveys should be available within the next couple of years. These efforts to develop new, and enhance existing, asthma surveillance activities represent an exciting opportunity to increase our understanding of asthma in New Hampshire.

REFERENCES

1. US Department of Health and Human Services. Respiratory diseases [Goal 24]. In: Healthy People 2010. Washington, DC: US Department of Health and Human Services, 2000.
2. Mannino DM, Homa DM, Akinbami LJ, et al. Surveillance for asthma—United States, 1980-1999. In: CDC Surveillance Summaries, March 29, 2002. MMWR 2002;51(No. SS-1):1-13.
3. Centers for Disease Control and Prevention: Asthma prevalence and control characteristics by race/ethnicity—United States, 2002. MMWR 2004; 53:145-148.
4. Asthma and Allergy Foundation of America. Cost of asthma in the United States. Available at: http://www.aafa.org/templ/display.cfm?id=67.
5. National Institutes of Health, National Asthma Education Program. Expert Panel Report 2: guidelines for the diagnosis and management of asthma. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute, 1993; 1-153.
6. Lengerich EJ (ed). Indicators for chronic disease surveillance: consensus of CSTE, ASTCDPD, and CDC. Atlanta, GA: Council of State and Territorial Epidemiologists, November 1999.
7. Centers for Disease Control and Prevention. Key clinical activities for quality asthma care: recommendations of the National Asthma Education and Prevention Program. MMWR 2003; 52 (RR-6):1-8
8. Ford ES, Mannino DM, Williams SG. Asthma and influenza vaccination—Findings from the 1999-2001 National Health Interview Surveys. Chest 2003;124:783-789.
9. Centers for Disease Control and Prevention. Prevention and control of influenza: recommendations of the Immunization Practices Advisory Committee (ACIP). MMWR 1992; 41(RR-9):1-16.
10. Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994. J Allergy Clin Immunol 2000;106:493-9.
11. Centers for Disease Control and Prevention. Council of State and Territorial Epidemiologists, asthma surveillance definition. Atlanta, GA: US Department of Health and Human Services, CDC, National Center for Environmental Health, 2001.
12. New York City Department of Health, New York City Childhood Asthma Initiative. Asthma facts. Available at: http://www.ci.nyc.ny.us/html/doh/html/asthma/asthma.html.
13. US Department of Health and Human Services. Healthy people 2010 (conference ed, 2 vols). Washington, DC: US Department of Health and Human Services, 2000.
14. New Hampshire Department of Health and Human Services. Healthy New Hampshire 2010. Concord, NH: New Hampshire Department of Health and Human Services, 2001.
15. Michigan Department of Community Health. Epidemiology of asthma fact sheet. January, 2001.
16. Nebraska Health and Human Services System. Nebraska epidemiology report. Asthma in Nebraska, 1987-1998. March, 2001.
17. American Academy of Allergy, Asthma, and Immunology. National asthma training curriculum (unpublished draft).
18. National Center for Health Statistics. Asthma prevalence, health care use and mortality, 2000-2001. Available at: http://www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm.

APPENDIX A: NEW HAMPSHIRE BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM ASTHMA QUESTIONS

Adult Asthma Core Questions

2000 BRFSS:

1. Did a doctor ever tell you that you had asthma?
    a. Yes
    b. No
    c. Don't know/Not sure
    d. Refused
2. Do you still have asthma?
    a. Yes
    b. No
    c. Don't know/Not sure
    d. Refused

2001, 2002 BRFSS:

1. Have you ever been told by a doctor, nurse, or other health professional that you had asthma?
    a. Yes
    b. No
    c. Don't know/Not sure
    d. Refused
2. Do you still have asthma?
    a. Yes
    b. No
    c. Don't know/Not sure
    d. Refused

Adult Asthma History Module, 2002*

1. During the past 12 months, have you had an episode of asthma or an asthma attack?
    a. Yes
    b. No
    c. Don't know/not sure
    d. Refused
2. During the past 12 months, how many times did you visit an emergency room or urgent care center because of your asthma?
    a. Number of visits
3. During the past 12 months, how many times did you see a doctor, nurse, or other health professional for urgent treatment of worsening asthma symptoms?
    a. Number of visits
4. During the past 12 months, how many times did you see a doctor, nurse, or other health professional for a routine checkup for your asthma?
    a. Number of visits

5. During the past 12 months, how many days were you unable to work or carry out your usual activities because of your asthma?
   a. Number of days
6. Symptoms of asthma include cough, wheezing, shortness of breath, chest tightness, and phlegm production when you don't have a cold or respiratory infection. During the past 30 days, how often did you have any symptoms of asthma?
   a. Less than once a week
   b. Once or twice a week
   c. More than 2 times a week, but not every day
   d. Every day, but not all the time
   e. Every day, all the time
   f. Don't know/not sure
   g. Refused
7. During the past 30 days, how many days did symptoms of asthma make it difficult for you to stay asleep?
   a. None
   b. One or two
   c. Three to four
   d. Five
   e. Six to ten
   f. More than ten
   g. Don't know/not sure
   h. Refused

*These questions were only asked of adults that answered 'yes' to both core questions listed above (i.e. had current asthma).

Childhood Asthma Module

2000 BRFSS:

1. Did a doctor ever tell you that a child of yours has asthma?
   a. Yes
   b. No
   c. Don't know/Not sure
   d. Refused
2. Does your child take medication for his/her asthma?
   a. Yes
   b. No
   c. Don't know/Not sure
   d. Refused

2001, 2002 BRFSS:

1. Earlier you said there were (#) children age 17 or younger living in your household. How many of these children have (or has this child) ever been diagnosed with asthma?
2. How many of these children still have asthma?

APPENDIX B: HEALTHY PEOPLE 2010 AND HEALTHY NEW HAMPSHIRE 2010 OBJECTIVES FOR ASTHMA

Healthy People 2010 Objectives

24-1. Reduce asthma deaths
From 2.1 per million to 1.0 per million in children less than 5 years of age
From 3.3 per million to 1.0 per million in children 5 to 14 years of age
From 5.0 per million to 3.0 per million in persons 15 to 34 years of age
From 17.8 per million to 9.0 per million in persons 35 to 64 years of age
From 86.3 per million to 60.0 per million in persons 65 years of age and older

24-2. Reduce hospitalizations for asthma
From 45.6 per 10,000 to 25 per 10,000 in children less than 5 years of age
From 12.5 per 10,000 to 7.7 per 10,000 in persons 5 to 64 years of age
From 17.7 per 10,000 to 11.0 per 10,000 in persons 65 years of age and older

24-3. Reduce hospital emergency department visits for asthma
From 150.0 per 10,000 to 80 per 10,000 in children less than 5 years of age
From 71.1 per 10,000 to 50 per 10,000 in persons 5 to 64 years of age
From 29.5 per 10,000 to 15 per 10,000 in persons 65 years of age and older

24-4. Reduce activity limitations among persons with asthma from a 1994-1996 baseline level of 20% to 10% by 2010.

24-5. Reduce the number of school or work days missed by persons with asthma due to asthma. (Developmental)

24-6. Increase the proportion of persons with asthma who receive formal patient education, including information about community and self-help resources, as an essential part of the management of their condition from a 1998 baseline level of 8.4% to 30% by 2010. (Developmental)

24-7. Increase the proportion of persons with asthma who receive appropriate asthma care according to the NAEPP Guidelines. (Developmental)

24-8. Establish in at least 25 states a surveillance system for tracking asthma death, illness, disability, impact of occupational and environmental factors on asthma, access to medical care, and asthma management. (Developmental)

Healthy New Hampshire 2010 Objective

Reduce hospitalizations for pediatric asthma (0 to 17 years of age) from a 1998 baseline level of 10.5 per 10,000 to 7.9 per 10,000 by 201